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The Phoebe and the Pewee.

BY THEODORA RICHARDSON.

With the awakening of brooks, and new life showing in the tender green of willow shoots, and poplar trunks, the coral red of maples, and grassy green on southern slopes, March cheers bird lovers with a few carols of the bluebirds, bright windy chatterings of the redwings, and orchard choruses of fox-sparrows and other migrants.

Among these we at last hear the sweet, trustful notes of the Phoebe, who holds an undisputed place in our affections. He is reported to arrive in Cambridge about March 25, and would reach here perhaps a week later. This year our first sight of him was April 14. Perched upon a "corn-barn," that remnant of New England thrift, he was pouring out the Phoebe note in that incessant drawl of his.

In the niches of the hand-hewn timbers of the corn-barn, we found two dainty Phoebe nests of mud, fine rootlets, and hairs, with soft interlining of downy feathers. From the nature of their position they were unharmed by wind and weather.

One day a Connecticut farmer called the attention of Bur-

roughs to a Phoebe nest of six stories built under his porch. As there was but one shelf, the bird had built a nest above the old structure each year, making this remarkable pile. Most frequently, however, this bird nests beneath bridges, fastening its home to the rafters, where, sad to relate, its offspring sometimes die from attacks of too numerous insects.

The Chickadee has a Phoebe note; of quite different pitch and cadence, however, from the true Phoebe note. It is as though high E were taken for pitch note, and a slur made to D sharp for lower note. One may hear this in midwinter, for the Chickadee, a seed eater, remains with us, while Phoebe, the insect eater, migrates. Make a drop from high E to C natural and this gives the relative difference between the two songs; when once detected they cannot be mistaken. The Phoebe too has a soft preface note which is not noticable unless the listener be near the bird.

I first made the acquaintance of the Wood Pewee, a little woodland cousin of the Phoebe, in a thick maple grove. It was midsummer, with the hot July sun pouring into the depths of the shady solitude. The Pewee sat unconcernedly upon a maple twig, pouring out his sweet pe-a-wee, (with drawl upon first and last syllable) when without the least warning he darted off in the midst of that drawl, caught an insect while on the wing, returned to his bough, and having swallowed his morsel all in one instant, he finished his drawl. His song, sung in his favorite high trees in dark woods, is moderate, gentle, and pen-

sive, his vigorous and alert movements being in strong contrast to his song. The Phoebe and Wood Pewee have very similar coloring, fuscous, (that is a slaty olive color) above, and yellowish white beneath. The former has an all black bill, while the latter has upper mandible black, and lower mandible yellowish; the Phoebe without wing-bars, and Pewee with. The latter also has wings longer than tail. She builds in a tree from twenty to forty feet up, a nest similar to her cousin but without mud, using lichens for outside covering. She is much smaller than Phoebe. Both belong to the "Fly catcher" family, all of which migrate to the tropics except the Phoebe which is often heard in winter in Florida swamps.

The Phoebe flitting in and out of my pear tree catches which kind of insects? Does he catch the same kind in Florida? Are there so many, of his favorite kinds, in Florida that there is no temptation to seek the tropics? Why do the smaller fly catchers, the Least fly catcher, and the Wood Pewee go further south than Florida? Is it because their insectivorous feast is of a different kind from that of the Phoebe? Patient observation will determine much for us. We all see about the same; to one it means much, to another little.

As Burroughs has said, "How much patient observation it takes to settle many of the facts in the lives of the birds, animals, and insects. Study of nature deepens the mystery and charm because it removes the horizon farther off. We cease to fear, perhaps, but how can one cease to marvel and to love?"

Mr. and Mrs. F. W. Batchelder sailed from New York, for the Mediterranean tour, on Saturday, May 19, bearing with them the sincere good wishes of many friends. It was hoped that something from the genial professor's pen might appear in the first number of NATURE STUDY, and he did make an earnest effort, writing an article while on the train, and mailing it just before sailing. It will appear in the July number.

Turtles of New Hampshire.

BY WILLIAM H. HUSE.

Turtles are not the least interesting of reptiles. They show their relationship to the rest of the class reptilia by their oviparous origin, cold blood and structure, but differ from all other reptiles by the peculiar development of the ribs and sternum into two shields which are covered by an ossification of the skin, thus making an armor which more or less completely protects them from their enemies. The upper shield is called the carapace; the lower one, the plastron. These are the most prominent features of a turtle's anatomy and are the means of most readlly identifying a species.

New Hampshire contains six species of land and fresh water turtles. The largest is Chelydra serpentina or snapping turtle. This is also locally called black turtle and mud turtle, which latter name is also given by the unthinking to all fresh water turtles. It attains a length of two feet or more, some specimens being reputed of a size and strength sufficient to carry a man upon the back. The carapace is of a dull brownish black color, frequently covered with moss, showing less activity than the proverbial stone. Sometimes a row of projections on the back shows the inability of the carapace to wholly conceal the spine, the presence of which is also indicated by a row of protuberances along the tail. The plastron is small compared with the carapace and is of a yellowish color. The skin of the neck is rough and warty. The English name is given it because of its habit of snapping at every living thing large and small that interferes with it. It is rarely seen on land except when the female comes out to deposit her eggs in the sand. These are spherical and have hard shells. The flesh is eaten and is much esteemed.

The smallest of our turtles is Aromochelys odoratus or musk turtle, so called because of the odor of musk which it emits at times. The maximum length is about six inches; the color of

the upper shield is dark brown ; the head is black with two yellow stripes on each side ; the tail is small. The nose is pointed and snaps at an intruder with all the viciousness of the snapping turtle. The plastron is small and is hinged just in front of its junction with the carapace allowing the forward portion to be moved. The eggs are elliptical, nearly twice as long as thick and have very thick shells.

Chrysemis picta or painted turtle is one of our most common tortoises. The length of a full grown specimen is about eight inches . the back is brownish black with sometimes a greenish cast, each plate being lighter around the edge. The margin of the carapace is ornamented with red and yellow lines. The plastron is large and yellow. The head is black with yellow lines on the sides.

Chelopus guttatus or spotted turtle is a little smaller than the preceding with which it is commonly found. The general color is black with yellow spots scattered irregularly over the back The plastron is mottled with black and yellow.

The tortoises described are aquatic and carnivorous in their habits. The other two that are found in the state are terrestrial and herbivorous, largely, if not entirely.

Chelopus insculptus or wood turtle is next to our largest species, attaining a length of nearly a foot. The general color of the carapace is brown, sometimes shading into yellow. Each plate is embossed in such a way as to resemble a shell. The plastron is yellow with a black blotch on each plate. A specimen that I kept in confinement a part of two seasons fasted for several weeks after being caught, but was finally brought to his appetite by ripe strawberries. After that he would eat almost any soft vegetable food. A tub of water, sunk in the ground, furnished him with drink, but he had no other use for it until cold weather, when he went to the bottom of the tub and staid there. Tub, turtle and all were removed to the cellar where he slept quietly until thawing weather occurred when he was found crawling about the cellar floor. The second season he was placed in a small yard with some rabbits

whose board he shared if not their bed. At last he repeated the old fable in revised form by climbing up the poultry netting that served as a fence and escaping while his long legged companions stayed behind.

Cistudo carolina or box turtle inhabits only the southern portion of the state, I think. I have never known of its being found north of Pelham. This tortoise is nearly hemispherical in shape. The carapace is brown with irregular yellow markings scattered about. Its greatest peculiarity is in the hingeing of the two shells. They are connected by a tough skin which allows some movement. The plastron is hinged just in front of its union with the carapace so that it can be closed at both ends, shutting up like a double clam shell. Upon the approach of danger the head and legs as well as the tail, which is very small, are drawn in and the plastron shuts up like a miniature portcullis when the timid little baron is safe within his castle from any enemy that cannot batter in the walls. The food of the box turtle is said to be vegetable. A specimen that I once had for two months refused to eat anything. I finally deprived him of what appetite he may have possessed and his head and placed the shell in the museum of the Manchester Institute.

The unusual mortality among insectivorous birds has attracted attention in Manchester and adjoining towns. Nine dead birds were brought in by the pupils of a single Manchester school in one day; several were brought to the Institute rooms on the succeeding evening, and many were reported. From the 21st to the 23d of May, examination of about 20 specimens showed empty stomachs in each case. The conclusion appears to be logical that the cold weather has retarded the hatching of insect eggs, and that the birds have starved in consequence.

Communications are desired from our subscribers everywhere. Observe carefully; take notes fully; then write the story as briefly as possible and send it to NATURE STUDY.

The June-Bug.

BY WILLIAM J. LONG IN "THE OUTLOOK."

Thou stupid blockhead, blundering in my face!
Is not the great world wide enough, but thou
Must quit the dusky night where thou'rt home
To dazzle at my lamp, and burn thy wings;
To blind thy goggle eyes with too much light,
And bang thy doltish head 'gainst every thing?
Thou meddling fool! thou'rt ever out of place.
No meeting's free from thy disturbing buzz;
No child too timid for thy scaring hum;
Nor lady's nerves too strung, nor hair too fine
For thee to tangle it with scratchy claws—
There in my ink again!

And now, with pondering look and drabbled feet,
Thou scrawl'st rude line across an unstained page.
And yet, poor thing! thou dost not mean it so;
The light attracts thee! and thou would'st know.

How like we are! This dazzling light to thee—
Why, that's the sunlit world; and we poor men
Do bang our heads 'gainst every wall of it,
And wonder why they ache. Our blundering feet
Tramp rough-shod over nerves that twinge in pain;
We meddle daily with the mysteries,
To frighten timid souls with buzzing talk.
Of laws of unknown things, and life, and death;
We burn our souls in many a garish lamp;
And many a page lies stained with thought more rude
Than beetle's legs could draw, and less intelligent.

And yet, from out the gloom of our first flight,
The primal twilight of our ignorance,
'Twas shining of a light that called us in.

Pardon, fellow-blunderer! Mine's the fault,
Impatient of the things I do myself,
The fashion only altered. Blunderers both!
The one with open book and bruised heart,
The other with his broken wings and feet.
There, I'll blow out the light; it troubles thee;
And here's a bit of wool to dry thee on,
Rest thee a moment till thy dazed head clears;
Then, (there's the window open) go in peace—
And may the gentle God, who made us both,
When next I blunder in His mighty face,
Do so with me.

Incidents of Spider Life.

BY SUSY C. FOGG.

Early in the spring, before small life becomes abundant, the bright-eyed boy or girl may observe upon the bark of a tree, the side of a building, or sunny window-pane, a small, black spider, which attracts attention by its quick, jerky movements, sidewise or backwards, as well as forward, and the spot and narrow bands of white or orange upon the abdomen.

Upon looking again one sees that the legs are comparatively short and strongly developed, that the jaws, or cheliceres, are metallic green, and that the whole appearance of the spider is self-contained and rather bold and jaunty as he rears the front portion of his body to listen for his prey.

This spider is Attus tripunctatus, of the family Attidae, the jumping spiders, and is common throughout our country, especially New England. This genus secures its prey by jumping upon it and holding it fast with its strong jaws, and has no use for the web, strewn with remnants of past-enjoyed feasts, peculiar to other spiders, and spins only a silken case in which to lay the eggs, to moult or hibernate.

If one of these spiders be magnified the body is seen to be thickly clothed with whitish hairs, and the prominent eyes to be arranged in a semi circle on the head part of the cephalothorax as shown in the cut, which is reproduced from Hentz, plate 18, figure 75, as reprinted by the Boston Society of Natural History. The largest of these can be seen with the eye alone.

The eyes of spiders are curious and variable in arrangement. Attus, as represented in the diagram, has four pairs, a usual number, but Professor Comstock states in his "Manual," that there may be spiders with "one, two or three pairs; and certain cave spiders are blind."

Upon observation Attus has shown good powers of sight and

hearing — if spiders can hear. A fly comes buzzing about the window and the spider immediately hears, or perceives, and crawls forth from some hidden crevice. The fly blunders into first one corner and then another, appearing undisturbed unless some object in motion comes within its range of vision. In regard to this, Attus has inherited good judgment, acquired by his ancestors, through years of experience, and wisely waits motionless until the unwary fly has passed by near him, and then running from behind rapidly at first, but as he approaches nearer, flattening the body and creeping along with all the stealth of the cat family, pounces upon the back of the fly and binds the wings of his victim about the body so instantly that the eye cannot analyze the movements of the spring.

People in general have a natural aversion to spiders, but no local spiders are dangerous, and are in no way to be feared, like the flies, which while from the very fact that they do great good as scavengers, are wont to hover about our food, and scatter the death dealing germs of disease which may lurk in the corrugations of the tongue and in the pulvilli with which the feet are clothed.

Spiders have many interesting habits, which are worthy of of study. A pretty observation was made on the common grass spider, Agalena naevia, during last fall. An individual was captured and placed in confinement in a glass jar. The mother spider feeling a sense of contentment and seclusion, soon layed a flattened mass of delicate, flesh colored eggs. When this was accomplished, she spent the entire morning in shaping and kneading the eggs into a neat ball, by means of the two tiny straps which project from the end of the abdomen. Over this she spun a covering of whitest silk, and half concealed in the meshes, she prepared to hibernate and faithfully watch over the dainty nest which she had arranged with so great care.

The Study of Rocks.

BY GEORGE I. HOPKINS.

"We wound
About the cliffs, the copses, out and in,
Hammering and clinking, chattering stony names
Of shale and hornblende, rag, and trap, and tuff,
Amygdaloid and trachyte."—*Tennyson.*

To most people a rock is simply a rock, unsightly, uninteresting, and ordinarily in the way. To the traveller along the highway rocks are only so many vexatious obstructions to easy and comfortable progress. To the farmer they are, for the most part, hindrances to rapid and economical tilling of his land. Few, indeed, think of their presence otherwise than as a nuisance, or, on occasion, as a convenient missile, excepting, of course, the gems, the ores, and quarried rock for building; and fewer still realize that the mud and sand and soil was once a part of solid rock, just like the ugly, heavy, cumbersome things they see every day.

It is not difficult, however, to arouse a deep interest in many of the common rocks, if the right method be adopted. The statement that a certain boulder did not originate in the vicinity where it lies, but once formed part of a ledge many miles to the northward, rarely fails to elicit inquiries respecting its history, characteristics, resemblances to other rocks, etc., and usually results in a permanent interest being aroused. The breaking open of a pebble or boulder, and its examination with a magnifying glass will usually reveal its crystalline texture sufficiently to lead to inquiries and a further examination of it. An interest thus aroused is likely to become contagious and develop into a real enthusiasm.

The writer once succeeded in getting to the railroad station a cross section of a wide and deep glacial groove. While waiting for the early morning train that was to convey him and the rock to his home, a farmer came up and looked the rock over, noticed the groove, and felt its polished surface. For some

minutes nothing was said by either of us. I watched him closely as he seemed to be meditating. Suddenly he looked up, stroked his beard, and declared, with the air and in a tone of thorough conviction, that "Something or other must have done that." After such a manifestation of interest I could not forbear to give the old gentleman some elementary information in regard to glaciers and the work they have done as geological agents. I never had a more attentive or interesting audience in my life. As I boarded the train my audience thanked me for the lesson and declared that he should look upon rocks with a different feeling thereafter.

There is no question but that there are many who need only a few suggestions or directions in order to get started in a proper manner for a satisfactory study of the rocks. The number of common minerals does not exceed fifty, and some of these have such prominent characteristics that a few simple tests disclose their identity. There is still a larger number, not so easy of identification, but concerning which it is comparatively easy to obtian a clew. Then, following up the clew by use of properly prepared tables and apparatus discloses the family name and, in most cases, the species. For example, the lack of cleavage, its vitreous lustre, and hardness will in most cases distinguish the common varieties of quartz, the most widely distributed mineral with a single exception. The peculiarities of coloration of the less common varieties of quartz, in addition to the other properties, will generally suffice to distinguish these also.

Take also mica, a very widely distributed mineral in New England, and specially prominent in New Hampshire. After an examination of its tructure, even a brief one, the thin leaves, or foliae, are so prominent, that no one wonders that it is cited as the type of perfect cleavage; and its structure in thin sheets is so pronounced that when another mineral is found that resembles it in this particular it gives the name to the structure, i. e., micaceous.

There is another mineral, or rather, family of minerals, the

most widely distributed and most abundant of all, viz., the feldspar family. The most common species of this family is orthoclase, and it, too, is easily recognized by a few prominent characteristics. Break open almost any common boulder in New England, and we shall probably find all three of the above mentioned minerals mixed in varying proportions, and the individual particles ranging from minute to coarse. Those little shiny scales varying from black to almost colorless is the mica, sometimes erroneously called isinglass. The black variety is called biotite and the light colored is muscovite, the same material that is found in the modern stove door to give a cheery appearance to the otherwise monotonous black. Those small grains, that are glassy in appearance, more or less transparent, and sometimes of a dark smoky hue, are quartz. If we select one of the largest of the other pieces and examine it closely, we shall notice that one or more of its surfaces are quite flat, not so smooth and polished as the mica, but so much so as to make it quite unlike the quartz in that particular. If we take a piece of the quartz and try to scratch it with a corner or edge of this mineral, and vice versa, we shall find that the quartz is the harder. If we persist and break up several pieces we shall probably soon find a piece where there are two flat surfaces perpendicular to each other or very nearly so. We shall see also that these two surfaces glisten and reflect the light more completely than do the quartz surfaces, which are quite irregular. The geologist explains this difference by saying that the mineral we are comparing with quartz has distinct cleavage, i. e. it splits evenly and smoothly in certain directions, while the quartz does not, and the surfaces thus exposed are called cleavage planes. Those two cleavage planes at right angles to each other are characteristic of feldspar, and so we find the third substance to be of that family. In color the feldspars vary here in New England from a white through gray to a flesh red, or salmon color. These three minerals are the principal constituents of the rocks granite and gneiss.

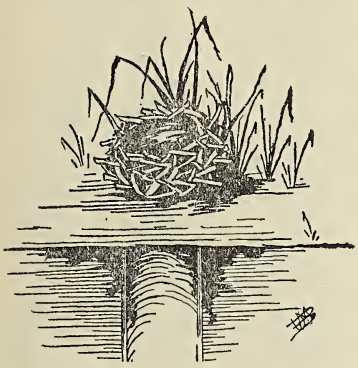
Sometimes, instead of the shining mica surfaces, we find a

black or deep green brittle mineral mixed in with the quartz and feldspar. This is called hornblende and serves to distinguish one variety of granite. Frequently other minerals are found with these but in smaller quantities and often in the form of crystals. These are classed as accessory minerals, and consideration of them must be left for a future article.

The Turret Spider -- Lycosa Fatifera.

BY GEORGE E. BURNHAM.

Many people are apt to believe that the more curious and remarkable objects of nature are to be found only in other lands, or, at the nearest, in distant parts of their own country. New Englanders, for example, read with interest of the Trap door Spider, found in Florida, California and other States, but have little or no idea that in our own fields and pastures may be found a true equivalent — the Turret Spider, or, as known to scientists, Lycosa fatifera. This arachnid, deriving its scientific designation from *Λυκος* (wolf) and fatifer (death-dealing) fully deserves its name — the death-dealing wolf. In wandering in the fields, any time from the day that the earth is yielded up to summer by Jack Frost, to the time when it is again locked in the embrace of winter, we may find the round shafts of Lycosa, tunneled to a depth of from six inches to a foot and a half, and surmounted by a turret of small twigs and grass, an inch or two in height, which is held together by a neatly spun network of finest silk.



If we are interested in this "wolf" spider, we will excavate one of these holes. After leaving the surface of the ground, we

find that the occupant discontinued the silken lining and drilled a shaft, smooth and straight, and gradually enlarged toward the bottom. If we have chosen one of the larger pits, we shall dig to the depth of sixteen to eighteen inches, and may discover the owner of this subterranean abode lying at the bottom of the shaft, waiting for an unlucky insect or other small creature which may be so unfortunate as to fall into her trap.

Lycosa fatifera is one of our largest spiders, and an accurate description was first given by Hentz, in his writings on the spiders of the United States: "Bluish black; cephalothorax deeper in color at the sides; cheliceres covered with rufous hairs, and with a red elevation on their external side near the base."

Hentz mentions the fact that excavating these spiders is a very difficult task, and that he had recourse to inserting a slender straw until he felt resistance at the bottom of the shaft. He also states that in some instances he had brought the occupant to the surface in this manner, as the enraged spider grasped the straw and clung to it with persistency. But there is a much easier, as well as more satisfactory, way of digging out Lycosa's pitfalls. If calcined plaster, mixed very thin, is poured into the shaft, its gravity will cause it to sink to the bottom of the tube, the air rising and permitting the plaster to fill the shaft. If this then be allowed to "set" a few minutes, it will be found easy to excavate and secure a perfect cast of the entire tunnel.

Hentz is responsible for the statement that Lycosa fatifera has a poisonous bite, but he adds that its cheliceres, or fangs, cannot open at an angle large enough to admit of its biting large objects, and he concludes that, as the

habit of these spiders isto shun the society of man, they are not to be considered dangerous — a conclusion which science and experience alike have demonstrated to be correct.

The Turret Spiders feed upon caterpillars and such other insects as fall into their pits, or as they can catch in brief wanderings abroad. Snakes sometimes attempt to drag these spiders from their holes. In one case a black snake was observed with its head thrust fully twelve inches down the shaft, tempted, doubtless, by the spider herself, or by such small creatures as had fallen down the shaft. To guard against being thus taken, as it were, in a cul-de sac, the larger spiders (for the smaller ones are comparatively safe from attack by reason of the small size of their pits) often construct a side tunnel at the base of the main shaft, and parallel to it, in which they may lie in wait for their prey, in freedom from the peril of falling victims themselves.

A New Mineral.

The chances for the discovery of a new species in any branch of natural science by the average student are not numerous, and fewer, probably in the domain of mineralogy than in any one of the other lines.

So it is of especial interest to the members of Section F of the Manchester Institute of Arts and Sciences to learn that a new mineral has recently been discovered in the town of Grafton, N. H., and has been named graftonite. This mineral was first found on the south side of Melvin Mountain about five miles west of the village of Grafton. It occurred irregularly through a coarse crystalline mass of quartz and feldspar, a pegmatite vein, the masses of the latter mineral being in some instances fully four feet long. With the graftonite were found also beryl, tourmaline, garnet, muscovite, and biotite, all in rather large crystalline masses. More intimately associated with this new mineral, however, was the mineral triphylite, the

two occurring in the same mass in alternate layers in the ratio of three to four, the graftonite predominating. Its color is a delicate salmon and it crystalizes in the monoclinic system. In chemical composition it is a complex phosphate containing iron, manganese, magnesium, calcium, lithium, sodium, and potassium.

We hope some member of Section F will be fortunate enough to secure a specimen of graftonite for the Institute.

Miscellaneous Notes.

In accordance with the purpose of the Institute to extend its influence wherever it may be desired, the Council, on May 19, recommended an amendment to the By-Laws, for the formation of " branches " elsewhere. By its provisions, five or more persons, not residents of Manchester, may organize a branch, which shall have the management of its local affairs, and may unite with the Institute as an individual member by the payment of one dollar admission fee and of three dollars annual dues, the branch to receive a copy of the Journal of Proceedings, and its members to have the privilege of the Institute rooms, library and museum when in Manchester.

Many New Hampshire people, interested in nature studies, have hitherto found it inconvenient to obtain necessary adjuncts, such as magnifiers, insect pins, nets. sheet cork, and the like. The enterprise of the John B. Varick Company has removed this difficulty, as will be seen by the advertisement on fourth page of cover.

Botany is not represented in the present number, but in the future the four departments — Mineralogy, Entomology, Botany, and Ornithology will receive impartial attention.

If you think well of this number, and wish to encourage the enterprise, send fifty cents and your address to NATURE STUDY, Manchester, N. H.

NATURE STUDY.

A MONTHLY BULLETIN OF THE

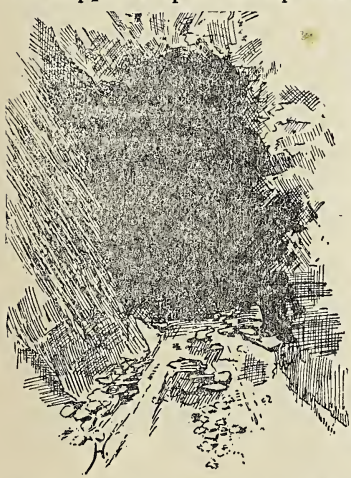
Manchester Institute of Arts and Sciences.

VOL. I. JULY, 1900. No. 2.

Stalactitic Limonite Near Manchester.

BY WILLIAM H. HUSE.

A short distance east of Lake Massabesic and about half a mile south of the picturesque village of Auburn rises a small, wooded hill with rounded top and somewhat steep sides whose gneissic frame crops out in places through its coating of soil and supports upon its top a few good-sized bowlders that came down from the north with the glacial ice-sheet. Through the middle of this mass of gneiss is a seam of mica schist somewhat loosely foliated and quite porous. The whole mass of rock is impregnated with iron.



Some time in the past a rending of the earth's crust occurred at this point and the mica schist, less solid than the gneiss, gave way and left a fissure extending for a short distance into the hill. The entrance is about six feet high and four wide. For a few feet the cave is as wide and high as the entrance. Then from

the left side a narrow crevice, just wide enough in places for a man to squeeze through, extends towards the middle of the hill for a distance of sixty-nine feet. About half way in one can climb up the perpendicular side at the right and come out at the end of the hole a little way up the hill eighty-one feet from the entrance. The name, Devil's Den, which has clung to the hole for generations, attests the orthodoxy of the early inhabitants.

The place is of more interest mineralogically than theologi cally because of a small deposit of stalactitic limonite that coats the walls and roof, except where it has been knocked off by visitors. The inside of the cave is always wet with water that trickles down through the porous rock and brings with it small quantities of the iron that is diffused through the hill. As the water evaporates a coating of iron is left which has in some places where it has been undisturbed acquired a thickness of four inches. Much of it is quite porous. Some specimens show plainly the layers that indicate the formation by aid of water, each layer perhaps showing the result of a season's evaporation. On the upright walls ridges of the deposit resemble ripple marks, while from the roof hang small projections, an inch or two in length, that show the stalactitic form of accumulation. The amount of the deposit is small and is of interest only to mineralogists, but to such it is well worth a visit.

Devadatta's Shooting.

From Arnold's "Light of Asia."

But it befell
In the Royal garden on a day of spring,
A flock of wild swans passed, voyaging north
To their nest places on Himala's breast.
Calling in love notes down their snowy line
The bright birds flew, by fond love piloted;
And Devadatta, cousin of the Prince,
Pointed his bow, and loosed a willful shaft
Which found the wide wing of the foremost swan
Broad spread to glide upon the free blue road,
So that it fell, the bitter arrow fixed,
Bright scarlet blood gouts staining the pure plumes.

A Few Common Mushrooms.

BY MARIA L. CLOUGH.

The fervent heats of July and the warm, moist atmosphere of August bring into visible life a host of exquisitely formed and many colored organisms, generally called toadstools or, by botanists, fleshy fungi or mushrooms; — the three terms being used synonymously here. They spring about us in lawns, and gardens, beside our streets, in old pastures and orchards, on decaying trees and in dense woods.

The collection and classification of these fungi, with special reference to their use as food, is a fascinating branch of nature study and it is the aim of this paper to describe and illustrate three common forms of undoubted edibility found in this locality, as a first step in the study of Economic Mycology.

A very large proportion of these fleshy fungi, which are not unpleasant to the taste or too tough, furnish delicious and nourishing food. On the other hand, there is one kind of mush room, the Amanita, of good taste and texture, which contains one of the most deadly of known poisons. The mushroom gatherer, therefore, cannot be too careful, and should make it an invariable rule that no fungus be eaten until it has been positively identified as a well known edible species, and unless it is in a fresh and perfect condition. An eminent authority says: "The dangerously poisonous species found in this country all belong to a single genus, the Amanitæ. About a dozen species of this genus are found. Three or four only of these are classed as poisonous and probably one, the Amanita phalloides, is responsible for most of the fatal accidents."

FIG. 1.

These poisonous mushrooms (Fig. 1) are of the common umbrella shape, with the cap varying in diameter from 3 to 8 inches according to the species, with gills

or lamellae fastened to the under side of the cap but not attached to the stem. In all these particulars they are similar to a most delicious mushroom, the common mushroom of the market, or "pink-gill," (Fig. 2) but otherwise there are important differences to remember. The poison mushroom has the stem enlarged at the base into a bulbous shape, surrounded by a cup or volva of membranous character. This cup is seldom perfect in shape but more or less broken and irregular, and in one species, the Amanita muscarius, consists merely of large loose scales growing upon the bulbous stem.

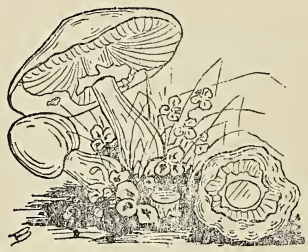


FIG. 2.

Let the beginner avoid with strictest care all mushrooms with bulbous stems having any trace of cup or scales. Another thing to remember is that the gills of the poison Amanita are always white, while those of the pasture mushroom or pink-gill are never white, being pinkish in the young stage and changing on maturity to a blackish brown.

There is one class of fungi especially adapted for the beginner in mushroom-seeking, since no poisonous species have yet been found in it. It is the Lycoperdon or puff-ball family, (Fig. 3) so familiar to us all, whose representatives grow singly or in clusters, in closely cropped pastures or in the grass. Any puff-ball in fresh condition, agreeable to the taste and which, upon being cut vertically, shows a uniform white texture, can be eaten with safety. Cut each one in halves vertically and see that it is of similar texture throughout, like cream-cheese. This precaution is necessary, as, in the earliest stages of the poison Amanita, in which the volva completely covers the young mushroom, it has the appearance of a white ball, aud might possibly be mistaken for a puff-ball. The cutting of the speci-

FIG. 3.

men, if an Amanita, shows the undeveloped umbrella form within the volva. These puff-balls may be found from June to November, especially where cattle are pastured. The smaller ones, peeled and cooked in cream or white sauce, and the larger ones, cut in slices and fried, make a most delicious dish.

While the terms fleshy fungus, mushroom and toadstool are used indiscriminately or interchangeably, there is one fungus to which the name "mushroom" specially belongs, this is the mushroom of the markets already referred to, the "pink-gill," or pasture mushroom of common parlance and the Agaricus campestris of the botanist, (Fig. 2.) It is the only species commonly cultivated, but it also grows freely in rich, sunny grounds, in lawns, gardens or pastures, but never in the woods. As before stated, the pinkish color of the gills is one of the distinctive points in its identification from the poisonous Amanita. The gills of the pasture mushroom are first pinkish, then ashy-pink and gradually change to a brownish-black color on maturity. The gills of the poisonous Amanita are always white.

The stem of the pasture mushroom is almost white and nearly solid, its length being about the same as the diameter of the cap. In its youngest stages the cap is nearly globular and is the "button mushroom" of commerce. In its older stages it grows more and more umbrella shape and gains a creamy or even brownish tint. The gills are not attached to the stem but only to the cap. In the young stage its pink gills are hidden from view by a delicate membrane which covers the surface of the cap and is fastened to the stem at a point somewhat below the lower edges of the gills. This is the veil. As the mushroom develops the membrane is broken and gradually disappears, leaving a slight ring, or trace of one, about the stem at a little distance below the gill surface. The diameter of the cap is 2 to 4 inches, or even larger, in the "horse mushroom" which is a variety of the pasture mushroom and equally good eating.

These mushrooms should be eaten while the gills are still pinkish, and are excellent cooked in any way in which an oys-

ter may be: saute, broiled, escalloped or creamed; all are delicious. If the foregoing description be carefully borne in mind, there should be no possibility of mistaking the pasture mushroom for any dangerous variety.

A third very safe and well-flavored mushroom is the Pleurotus ostreatus or oyster mushroom. (Fig. 4.) Like the preceding it is a gilled mushroom but has its stem attached upon one side of the center of the cap and sometimes even upon the edge, and the stem has a nearly horizontal instead of a vertical direction, as in the pink-gill. It generally grows upon the stumps of deciduous trees or where the branches have been removed and is found especially upon the elm, growing sometimes in enormous, overlapping clusters. The color of the cap is creamy white or light brownish. There are two other varieties of the Pleurotus, so similar in appearance and place of growth, as to puzzle all but experts to distinguish them, but both are equally safe and delicious. The Pleurotus must be used while young as it grows tough with age. It seems to be improved by allowing it to simmer slowly a short time in just sufficient water to cover, and then it should be cooked in cream or white sauce. There is no danger of mistaking this mushroom for any dangerous variety as no poisonous gilled mushroom is known to grow upon trees.

FIG. 4.

When a little experience has been gained in mushroom-gathering one will be surprised to find how quickly the eye becomes educated to detect the bad from the good and how much pleasure and "toothsome cheer" this new nature study will afford.

A special feature of the August number of Nature Study will be a paper by Prof. Clarence Moores Weed of Durham, giving an illustration of a most interesting case of adaptation to environment in our pastures and on our hillsides.

How to Find the Constellations. I.

BY GEORGE I. HOPKINS.

Astronomy is unquestionably the noblest of the physical sciences, and it is also the oldest. To most people the most attractive part of astronomy is the knowledge of the names and postions of the constellations in the sky throughout the course of the year. How and where the most of these constellations received their names history does not tell. The grouping and christening was probably done by nomadic people during prehistoric times. Whatever their origin, they are called by the same names today as were given them thousands of years ago. If the reader be interested to know and locate these ancient divisions of the heavens, the following directions will enable him to find them without other aid, if he already knows in a general way the four cardinal points of the compass. If he does not already know which direction is north, he can readily find some one who can tell him with sufficient accuracy for our purpose. For instance there is in all probability a road or street running very nearly in a north or south direction, or there is a house or or other building one dimension of which is in a north or south direction. This piece of information having been secured, let the observer take his station in a clear space where he can obtain an unobstructed view of the northern sky and horizon, some cloudless evening about nine o'clock, from the first to the tenth of July. Then, facing a little to the east of north he will see a group of stars near the horizon arranged so that the line joining them resembles the letter W rather widely spread out. This is the principal group in the constellation Cassiopeia and is one of the most prominent of the northern constellations. If, while gazing at this group, the observer will gradually raise his eyes toward the zenith, keeping his gaze fixed on the sky, he cannot fail to see a single bright star about half way from horizon to zenith. There is no mistaking this star, as there is no other bright one anywhere near it. This

is Polaris, the north or pole star. If the observer will watch this star from night to night and from hour to hour throughout the same night, he will find that the other stars circle round Polaris while the latter remains stationary. He will also discover that Cassiopeia is not found in exactly the same place in the sky on successive evenings at any given time of observation. The cause of this will be discussed in a future article. If now, while the observer's gaze is fixed on Polaris, he will swing around to the northwest, keeping his gaze at the same altitude, he will see a large group of brilliant stars in the shape of a dipper with the handle extending upward. This is so prominent and striking a group that it seems impossible to mistake it. This group is called the "Great Dipper" and is the principal one in the constellation Ursa Major, or Great Bear. The two lower ones of this group, it will be observed, lie in a line with Polaris, and, if observed on different nights, or throughout the same night, those three stars will always be found in he same relative position, i. e., very nearly in the same straight line. For this reason those two stars of the dipper are called "the pointers" because they point toward the north star. The knowledge of this fact is often of great value to travelers, sportsmen, and surveyors, as it enables them to determine the cardinal points of the compass and so make their way with safety and certainty.

It will be necessary to have some elementary knowledge of circular measure in order to locate satisfactorily many of the other stars and star groups; and so we will just state here what every reader probably already knows, viz., that the arc of a circle in the sky from the horizon to the zenith is 90°, being just a quarter of a circle, which contains exactly 360°. As a convenient unit of measure for future comparisons we will state that the distance between "the pointers" mentioned above, is almost exactly five degrees.

The stars thus far mentioned, and in fact, nearly all the stars that meet the observer's gaze, are called "fixed stars" because they do not change their positions relative to each other, i. e., they are fixed, or permanent in their relative positions. For ex-

ample, the Great Dipper, in whatever part of the sky it is seen, always presents the same appearance. It changes its position relative to the horizon, and points of compass, but whether it is right side up or bottom side up, its form of a dipper remains unchanged.

There are a few stars, however, that do change their positions relative to the other stars, and they were called by the ancients wanderers. Such are the planets, and mention is made of them here because two of them are now so prominent in the evening sky, and the observer should watch them closely during the next few months. Both can be seen in the early evening, say about half past eight, at nearly the same altitude, now about 30°, the one in the southeast and the other between west and northwest. The former is the giant planet Jupiter, and the latter the brilliant evening star Venus. We shall have more to say about this brilliant pair in a subsequent number.

A Fond Recollection.

From "Memories of Childhood" by the late Hon. Moody Currier.

In the bend of a nearby forest,
In a cool and shady nook,
There crept, in silence, the waters
Of a tiny, slender brook.

In the balmiest days of summer,
Alone in that nook have I strayed,
Or sat on the moss of the meadows,
Where the coolest of shadows are laid.

* * * * * * * *

I have talked with the catbirds and thrushes,
That mock each other in song,
Till weary with mocking and singing
The songsters have left me and gone.

I've followed the firefly in the darkness,
As it gleamed in the warm summer night,
And have found out the home of the glowworm,
By the rays of its own feeble light.

The Study of Rocks.

BY GEORGE I. HOPKINS.

A thorough acquaintance with individual minerals, in small particles as well as large ones, is the best equipment for the study of rocks composed of two or more of those minerals. In a former article a few simple and easily applied tests were given for the recognition of the three most common minerals in New England, viz., quartz, feldspar, and mica. Any one who has once seen specimens of the last named, whether in small scales or large sheets, whether black, white, pearly, or coppery in color, would rarely fail to recognize it afterward wherever met with, and in whatever combination. The quartz, too, is generally easy of recognition, as was said before, by its lack of cleavage and its hardness. The members of the feldspar family all resemble one another closely in their general appearance, luster, color, hardness, etc., but there are two groups of this family that the student must learn to distinguish from each other because it is essential in the classification of certain rocks. In one group there are two cleavage planes perpendicular to each other, and in the other the cleavage planes are all oblique to each other. These are named orthoclase and plagioclase respectively. There are several varieties of the latter, the most important of which are albite, oligoclase, labradorite, and anorthite; but as they differ chiefly in their chemical composition the ordinary student would be unable to distinguish them. After a few specimens have been carefully examined there will be little difficulty in detecting the feldspar. It will require a somewhat more careful examination to determine whether it be orthoclase or plagioclase, but as the former is much more common, the probabilities are in favor of any given specimen being orthoclase. It might also be stated that although all the feldspars are sometimes found to be white in color, yet albite is

much more frequently of that color, and so if a feldspar be found of a pure white color, the chances are it is albite, the name being derived from the Latin *albus*, meaning white.

These three minerals occur in great abundance in New England, sometimes in single masses, sometimes a mixture of all three, and sometimes a combination of two out of the three. If all three are present in a rock it is either gneiss (pronounced *nice*) or granite, the only difference being that the former shows a more or less stratified structure, or lamination, while in the latter it is wholly lacking. It must be said, however, that there is no sharp line of division between these two kinds of rocks, for there occur all gradations of structure from the undoubted and prominent stratification to the absolute lack of it, so that there will often be doubt as to which of these two classes a certain specimen belongs. So we have among the doubtful cases rocks which may be designated gneissic granite or granitic gneiss. If mica be replaced by hornblende then the rock is called hornblendic gneiss or hornblendic granite. If the rock contains orthoclase and quartz only it is called binary gneiss or binary granite, depending, as in the above cases, upon the presence or lack of stratification. If a surface of this binary gneiss be polished the arrangement of the constituent minerals is such as to resemble in some degree characters in some oriental alphabets, and on account of this resemblance it is often called graphic granite. Most of the New Hampshire granite contains the light colored feldspar, while the Scotch granite contains the flesh-red variety. This is the reason for the very light color of the former and the reddish hue of the latter. The Quincy, Mass., granite contains hornblende instead of the mica, and in consequence appears of a darker color. Granite is very durable and consequently is much used as a building material. It is not indestructible, however, as some similes would seem to imply, for the feldspar decomposes when exposed to the action of the air and moisture, very slowly in most cases, but surely, and that means the eventual crumbling of the entire mass, to become a part of the soil.

The Local Flora.

BY FREDERICK W. BATCHELDER.

The formation of an Institute, like ours, will give, has already given, a perceptible impetus to the study of the local flora.

But what is a local flora? Do not about the same plants grow commonly everywhere? Shall we not find violets and oaks and grasses and so on everywhere we go?

The flora of any given district does, to be sure, contain many plants which are common everywhere; but the difference between the sum total of plants in even adjoining districts are greater than one who had not studied the subject could suspect. There is a large number of plants common through extensive districts, a smaller number common only in restricted areas, a still smaller number which may be called strictly local.

The causes of the irregular distribution of plants are not yet well known. The new branch of botanical study now called "ecology," that is, the relation of a plant or species to its environment, is an attempt to follow up this subject in a systematic way.

To take an example right at home. At Manchester we have eight species of oaks, a remarkable number, particularly when growing as we find them on the west side of the river, all within the compass of a square mile. A few miles further north or south we find only two or three species. Why is this? Then as to the violets. Why have we not the Canada violet, and the long-spurred and the striate violets when they grow abundantly in adjoining districts? The grasses, which from their nature are subject to general distribution, are also governed by laws which we cannot yet formulate. We are continually meeting surprises, a northern grass here, a southern grass there, apparently out of place. Bear in mind I am speaking only of grasses which grow spontaneously, and not of such as are introduced accidentally, or by the direct agency of man.

So in the study of the local flora many elements of surpassing

interest arise. By and by we shall know more about the causes of the distribution of plants than we do now; and it should be the ambition of every member of the Institute to add something to the sum of *local* human knowledge, thus emulating in a small way the noble aim of the Smithsonian Institution.

To sum up in outline what I am driving at, we should acquire the habit of looking at all plants in their relations to other plants; and not only that, but in their as yet ill understood relations to the mineral and animal worlds. We want to find out why certain plants will grow on certain soils, what plants to expect on a given soil and how change of soil will affect given plants. We also want to investigate the relations of plants to insects, the agency of insects in their multiplication and their distribution.

All this is to be done right at home in a district very remarkable for the variety both of its flora and its fauna. The botanical section of the Institute has thus a great opportunity.

The Parula Warbler.

BY THEODORA RICHARDSON.

This little warbler has been very noticeable this year in several localities, and I am happy to say that its brightness of plumage is still to be seen in two localities near Manchester. Chapman tells us that it breeds from the Gulf States northward to Anticosti; winters from Florida southward.

Its peculiar insect-like song ending with staccato abruptness has, when followed up, revealed to me this sweet bit of the warbler family.

For three seasons, this being the third, I have seen him at the "Pulpit," and this year, on June 10, I experienced the pleasure of hearing him after I felt sure that he had migrated northward, for we last saw a number of this species at the same spot, Lake Massabesic, on May 12, on "Observation Day." He was one of twenty-seven kinds seen that day. Bradford Torrey in a recent article in the Atlantic Monthly says that ten

days' lingering in a locality is sufficient to make one conclude that the bird will nest thereabouts. And therefore we conclude that the Blue yellow-back will be found nesting in a locality where I have never known him to nest before, as the bird tenants in that vicinity are well known to me.

Compsothlypis americana, or Parula warbler, commonly called Blue yellow-backed warbler, has upper parts grayish blue; back with greenish yellow patch; two noticeable, white wing bars, a bright yellow throat, with its center deeply marked by rufous line; breast and belly white, outer tail feathers with white patch near the end.

This warbler makes one of the daintiest nests of the bird kind. It is made of the long gray-green moss found on dead larches, or hemlocks, and one has recently been donated to our "Institute" collections, which was found near Mosquito Pond. It is tiny, simple and beautiful in its completeness, the sole material, the moss, being wound round the dead lichen-covered hemlock, in such a manner as to most ingeniously deceive the casual observer. What a delight the finder of this unusually artistic nest must have experienced!

A Supposed New Flea.

BY EDWARD J. BURNHAM.

Ceratopsyllus talpalis: sp. nov. Eyes small, indistinct; comb-like row of spines beneath head and on apical margin of prothorax; spines of latter depressed, equal, wider than spaces between, obtusely pointed at apex, four times longer than wide; abdominal stigmata distinct, sub-ventral, at apical fourth of each segment; excavation of anal segment dorsal, shallow, elongate, arcuate; claws cleft, finely serrate. Length 2 millimeters. Parasitic on Scalops aquaticus, the common mole of the Eastern States.

The comb-like rows of spines beneath the head and on the

prothorax suggest affinity to Ceratopsyllus, as do the finely but distinctly serrate claws. The position of the stigmata is so distinctly different, however, that this flea may eventually be placed elsewhere, although it may tentatively, at least, rest in the genus already erected.

FIG. 1.

This flea, apparently undescribed heretofore, was obtained in large numbers from a mole secured by Mr. Edward H. Fogg in February last. Its life history has not been worked out, but from the known habits of allied species it may be assumed that the larval stage is passed in the nest of its host. Its structure affords a striking illustration of adaptation through selection. The mole, covered with hair so fine that it may be described as fur, passes its life for the most part beneath the surface of the ground, burrowing almost constantly for food, hurrying back and forth at surprising speed in its subterranean tunnels. It is evident that a flea, in order to remain upon its host under such conditions, must possess claws specially adapted to grasping; it must literally cling for life by tooth and nail, and we find the cleft, finely serrated claws even more distinctly developed than in the flea which infests the dog and cat, Ceratopsyllus serraticeps, shown in Figure 1. It is also smaller by rather more than one third, and its cape of strong spines on the prothorax lies more closely to the body. It is probably blind, as its small eyes, under high magnifying power, appear to be rudimentary, and are indistinctly defined as to contour. The under side of the feet are densely covered with pits which are undoubtedly sense organs. Thus equipped with organs of touch and with claws adapted to grasping the tiniest single hair, the mole flea continues to maintain itself with more or less success in what must be a precarious if not uncomfortable situation. Figure 2 is a good representation of the flea, and Figure 3 shows the thumb and finger like structure of the claw, all being highly magnified. Undoubtedly development is still going forward; the many fall and perish; the few cling successfully and survive.

FIG. 2.

FIG. 3.

Miscellaneous Notes.

The Dragonflies were late in coming this year, but they are now here in all their beauty of form and grace of motion.

Considerable interest has already developed in the formation of local branches of the Institute.

The collectors and students of Coleoptera have a rich supply of material in this section. It is evidently to be an "insect year."

The American Association for the Advancement of Science held its annual session in New York, June 25-30. The Institute was represented.

For the second season the several sections of the Institute have closed for a rest of two months, preparatory to a renewal of active work another autumn. The past year has been peculiarly rich in results in varied fields.

Section F., mineralogy, had a most interesting and profitable field day at the "Pulpit" in Bedford on Saturday, June 9. Forty one members went by barge, wheel and private team, and the trip proved to be a red letter event in the history of the Section and of the Institute.

The publication of Nature Study was undertaken after careful consideration of the responsibilities assumed. It was rightly held that the influence upon the Institute would be good in any event, and that the result in this respect would be sufficient warrant for the enterprise; but the most enthusiastic did not anticipate such support as has already made the modest little magazine an assured success.

A visit was paid recently to Mr. Charles F. Goodhue of Webster, favorably known to the lepidopterists of the country for his painstaking work among the moths and butterflies of New Hampshire. His collection is a striking illustration of the force of enthusiasm and industry under conditions which are in some respects adverse. Without the stimulus of organization and local rivalry, and without ready access to great libraries, Mr. Goodhue has pursued his studies alone and almost unaided, with results that are highly creditable to his State and must be gratifying to himself.

NATURE STUDY.

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A Rural Impostor.

BY CLARENCE MOORES WEED, DURHAM, N. H.

In tropical countries, as every one knows, there are many insects that mimic their surroundings. Wonderful tales are told by travellers of cunning creatures which so closely resemble leaf or twig or bark that it is impossible to distinguish them. But it is less generally known that in our own fields and woods there are many examples of such mimicry as wonderful as those of the tropics. In this brief sketch I wish to bring to light one such impostor.

Over a large part of the eastern region of the United States the fields and roadsides are overrun by a sweet fern, a low-growing shrub familiar to every one who has rambled through a New England pasture. It is a vagrant plant, not at all choice as to its situation, speedily taking possession of any unused land. It serves as host — presumably an unwilling one — to quite a list of insects that find good feeding ground upon its leaves. One of the most interesting of these is a strange caterpillar — a caterpillar in disguise, for it is strikingly different from its kindred.

Now caterpillars in general are smooth and cylindrical crea-

tures having well rounded bodies, although many of them are clothed with hairs to avoid tempting the greedy appetites of birds. But this insect is in effect at least a sweet fern leaf, and a sweet fern leaf has a very different appearance from that of an ordinary caterpillar. The leaf is long and narrow, with

ONE OF NATURE'S PUZZLE PROBLEMS — FIND THE CATERPILLAR.

many pointed teeth along each side the midrib, and of a dull green or brownish color, commonly having a rusty appearance. These peculiarities the caterpillar has copied so successfully that your chances of finding one of the larvae by searching the sweet fern branches in the field are considerably less than those of the person who hunts for a needle in the proverbial haystack. Even on a small branch on which you know the specimen is resting it requires sharp eyes to see it. It is one of Nature's puzzle problems in which you are to find the caterpillar.

When you succeed in distinguishing the insect from the surrounding leaves you should examine it closely to see in what ways this remarkable resemblance has been brought about. The first thing you are likely to notice is that each of the rings of which the body is made up instead of being round in outline as in other caterpillars is nearly triangular in cross-section. On each side of the median line the back of the ring has been de-

veloped into a pointed projection of the form of one tooth of the serrate sweet fern leaf. The repetition of the projections along the whole length of the caterpillar's body has rendered the resemblance to the leaf as a whole very striking. You will notice also that the head is small and angular, making a suggestive tip to the counterfeit leaf, while the underside of the body is flattened and the legs are inconspicuous.

The color of the caterpillar also helps it out in its mimicry of the leaf. The foliage of the sweet fern is dull green or light rusty brown, there being nearly always many leaves of the latter hue upon the plant. The caterpillar is generally of this brownish color, although the precise tint varies considerably.

If these sham leaves were constantly moving about, their shape and their color would profit them little. For birds know that true leaves do not wander from place to place upon a plant, and a bird seeing such a wanderer would be likely to peck at it to see what it is made of. Now to a caterpillar a peck is as bad as a swallow: if its skin is pierced its day's work is done. So you will find when you keep your caterpillar under observation that it will assume a certain position and remain rigid and quiet by the hour, apparently sleeping through the day. After the friendly shades of night have fallen it will probably wander about and feed freely upon the foliage, for then it is safe from observation by the eager eyes of the birds. But when day returns it will again become quiet.

The position commonly assumed by this caterpillar is to take hold of the stem with the pair of feet at its posterior end, and to hold the body rigidly out at the same angle that the leaves make in their attachment to the stem. Very often the position involves such a resistance to the force of gravity that you wonder how the insect keeps its front end in position for so long a time. If you look carefully, however, with a lens or reading glass you can see a silken thread extending from the mouth to the twig; this is the secret of the fixed position, for this thread holds the head in place.

How did this wonderful adaptation come about? Not so

very long ago the answer would have been that the Creator made the caterpillar so in order that it might escape from its enemies and additional strength would thus be given to the famous argument from design. Now, however, we simply cite it as another instance of the strange results of the centuries of struggle for existence through which the species has passed. In so doing we by no means deny that the Creator made the insect as we see it, but we simply say that the method of its perfection has been through the action of the laws of natural selection. For the mystery of life is as inscrutable as ever; we are merely learning step by step a little about the ways in which it manifests itself.

The Poisonous Sumacs.

BY WILLIAM H. HUSE.

The common name of our most poisonous shrub is a good illustration of the confusion of English plant names. We have seven species of dogwood, varying in size from the low cornel or bunch-plum to the flowering dogwood, which attains the height of a small tree, all of which are perfectly harmless; but when "dogwood" is mentioned many understand it to mean poisonous sumac. The number of people who thus misunderstand the name is almost equalled by those who do not know the shrub when they see it.

There are five kinds of sumac common in New Hampshire, three of which are harmless and two poisonous to the touch. The staghorn sumac, Rhus typhina, is our largest species, growing to the height of forty feet under favorable conditions. It is more often low and shrubby. Its pinnate leaves and pubescent twigs make it a handsome tree from June to October while in the fall its bright red berries in showy bunches make it especially attractive and conspicuous. The smooth or shiny sumac, Rhus glabra, resembles the first. The twigs, however, are

smooth instead of downy. The dwarf sumac, Rhus copallina, is usually smaller than the preceding two and is at once distinguished by the winged rachis or midvein of the pinnate leaves and the entire margin of the leaflets.

The most dangerous of this genus is the poison sumac or Rhus venenata, commonly called dogwood. This closely resembles the three species already mentioned and is the more dangerous because of the resemblance. It may be recognized, however, by several peculiarities. It grows in swamps while the other three species frequent higher ground. It is often abundant in low land, mingling its poisonous branches with willow and alder, ready to punish the unlucky boy who brushes it aside, unless he be poison-proof. Sumac poisoning is usually a serious affair. The nearly erect position of the leaflets gives the shrub a peculiar appearance noticeable from a distance when growing among bushes of about the same height. The fruit is grayish white, which is so prominent a distinction from the preceding species whose berries are red, that the following rhyme has been recommended as an aid in preventing disaster:

"Berries red,
Have no dread;
Berries white,
Poisonous sight."

For the first half of the season, however, there are no berries, and then this rule is useless. The shape of the leaves is an

infallible guide and once familiar with them one need make no mistake in attempting to recognize the sumacs.

Leaf No. 1 in the cut represents both the staghorn and shiny sumac. The leaflets vary from eleven to thirty-one in number and are sharply serrate. The shrubs may be distinguished by the downy or pubescent twigs on the former and the smooth branches of the latter. The dwarf sumac leaf is No. 2. The leaflets are fewer than those of the former two and the margins are entire. The most noticeable feature is the winged rachis already mentioned. The entire margin distinguishes it from the preceding two; the winged rachis shows that it is not No. 3, which is poison sumac. When you see entire leaflets and narrow rachis, Beware!

No. 4 with its three leaflets would hardly be recognized as a sumac. In fact no one but a botanist who studies the flowers and fruit calls it so. He knows it as Rhus toxicodendron. From its climbing habit it is called poison ivy. When it has nothing to climb it becomes rigid and stands erect. By some it is known as poison oak. Indeed, when it grows erect and bears leaves with short lobes as it sometimes does, it somewhat resembles a small, shrubby oak. Like many a human outlaw it assumes various characters but should be looked upon with suspicion in all. It is fond of clinging to the trunk of a tree, ascending to the branches and forming a very pretty covering for the gray bark. It climbs up a fence post or clambers over a wall, sending up a crown of foliage above its support. When there is no support and the ground is moist the stem lies on the surface from which the leaves rise, sometimes so abundantly as to conceal everything beneath them.

It is sometimes confounded with woodbine or Virginia creeper, a beautiful and harmless vine. This invariable difference should prevent any one from erring. The poison ivy has three leaflets, the woodbine five. This distinction has added two more lines to the above quoted jingle.

"Leaves three,
Quickly flee."

A July Morning at Winnipiseogee.

BY THEODORA RICHARDSON.

As I arose a robin was hopping on the ground under my window, before old Sol had yet peeped over the mountain's rim. Cedar-birds, in our stately pine, on whose broad protecting limb I discover a nest shaded by woodbine leaves above, are lisping their morning notes. They never sing more or less than this. But their beautiful dress is so rich in harmonious coloring that it is always a pleasure to watch them. Here is an unusual combination — a woodbine vine on a thriving pine; and in the cedar-bird's nest I see a bunch of string such as I have not seen in their nests heretofore.

In a small spruce not three feet from me, a Black and White Creeper has just caught a "daddy-long legs" and has carried the dainty morsel up to the broad oak limb for one of the babies.

But this wonderful sunrise now claims my attention, for I have never witnessed one with such a glorious foreground, and such a perspective, and such beautiful mountain surroundings as we have about Winnipiseogee, "The Smile of the Great Spirit." The sun rises directly in front of our cottage windows, behind a distant blue mountain, whose name we know not. Its rosy hue tinges all the landscape, making a rosy path straight toward us to the shore. The pines seem bathed in its caressing light, and each needle point gleams with a dewy gem.

The heavy massive blue-gray clouds hang low in the northwest, in great cumulus and nimbus masses, the only blue sky showing near the zenith. Momentarily the rose-like hue changes to gold. The immense gray masses are still shutting in and capping the northern mountains except Chocorua's boldly outlined summit. We have all come to love this beautiful mountain with its rocky crest, and to enjoy the ever changing light and shade as they play upon its crown.

The golden light is succeeded by the sun's white beams, which give all the eastern clouds their silver lining, and through

one rift of clouds a shaft of light is cast on the Ossipee range directly in front, and one of the tiny islands is also bathed in warm light, giving us a bright green with mainland dark forest hues for background. The surface of the lake is now covered with tiny ripples.

We have made our way to the hill commanding an extended view to the north of the lake toward Meredith. As we watch the ever changing panorama of sky, mountain, and water, our attention is called to the notes of wood and field about us. For the fascination of bird study is to know the commonest bird in his haunts. We hear the Song Sparrows below us, and off at our right we hear the Purple Finch in full song. The farm boy is turning out the Jerseys, the leader with a bell about her neck. How far away all care and worry seem, and what peace there is on the hill-top.

The Wood Pewee's note is distinct and plaintive. I heard him the last thing at night in the thick woods and he also seems to be an early riser. Now the tardy farm yard fowl's lusty note is heard. Next the Cat-bird gives us a morning overture, sitting in a low bush near; the Warbling Vireo assists with an obligato trill; the great yellow bumble bee adds a low bass to the other sounds as he sips the honey from the red clover.

The Oven-bird and Black Throated Green sing in the same spot where we have heard them for many days. In an orchard we discover a family of three or four King birds, clamoring for breakfast, and flitting from tree to tree, vainly trying to be first for a morsel. Farther along we catch the peculiar song of the Chewink with its laughing final note. And during the entire time, since we reached the hill, the Field Sparrow has kept up a running accompaniment.

Haven't the Goldfinches any young offspring to feed now? They seem to be flitting everywhere; in wave like undulations they pass and repass above our heads singing, "Per-chic-o-ree, per-chic-o-ree."

We are glad that the clouds are being lifted, and blown away

by the stiff breeze; white caps are dotting the lake's surface.

See the brilliant mass of color of the Purple Flowering Raspberry, with its purple rose-hued blossoms among its rich green maple shaped leaves. We have passed an array of red lilies, daisies, buttercups, yarrow, Canada thistles, mullein, St. Johnswort, loosestrife, yellow, white, and pink clover, caraway, bush-honeysuckle, and elderberry blossoms whose umbrella topped flowers make sweet the air, and dog-bane on which are brilliant metallic lustred beetles. Wild roses give off their perfume from a thick clustering bank. Self-heal with its blue clusters brightens the roadside pathway. The Meadow-sweet and its relative, the Hardhack, or Steeple Bush, swell the numbers.

Hear the Scarlet Tanager's note from the summit of that dead poplar-tree; sitting there against the blue sky he makes a strong contrast. It almost seems as though he wished to be seen. The Indigo Bunting finds the highest point of a pine-tree and pours forth his exuberance. A young Crow is lustily cawing among the shady pines; his voice is even more hoarse than that of his elders.

Chickadees and Red-eyed Vireos we have heard all along the route. A Phoebe adds a note not heard by me for many weeks; it is not the chickadee note, for I see the bird sing. Barn Swallows and tree Swallows flit across the blue. Hear the Chebeck and Maryland Yellow Throat in the clump of alders. How interesting the tailless Chipping Sparrow baby is, as he sits about three feet from the ground on a young maple, and makes as much noise as his mamma when she comes with a bit of luncheon for him. He is so ludicrous with his soft downy fuzz on his head, and like a young robin shows streaks on the breast, and a wide yellow rim to his mouth, which the adult birds in both families do not have.

The Wilson's Thrush gives us his mellow flute-like trill. How we long to hear the Hermit Thrush, which without doubt lives here. As we near the shore of the lake, the Belted King Fisher flies toward Lake Paugus uttering his exulting clatter;

the sweet mellow "Pip, pip" of the Spotted Sandpiper floats back to us as he flies away to the sandy beach. With the Chimney Swift and Redstart near at hand we have seen thirty-two different kind of birds since sunrise; and nineteen different kinds of blossoming plants. As we pass the water's edge we note thirty or more dragon flies, many of the small turquoise blue Zygoptera being in predominance.

Feeling repaid for our efforts, at early rising, we return at a rapid pace, to fill the hearts of our home listeners with longings to share in the wealth of beauty which we have so recently enjoyed.

The Rain Frog.

WRITTEN FOR "NATURE STUDY" BY JOHN P. SJOLANDER.

All day long a little frog
Sat, and blinked with beaded eyes,
On an old, moss-grown log;

All day long within the deep,
Brazen and unruffled sea,
Lay the wind in death-like sleep;

All day long the birds sang not,
But sat stifling in the trees,
For their throats were dry and hot.

But at eve, with voice most shrill,
Cried the frog to God for rain;
And his voice would not be still.

To his cry the answer came:
God spake from the morning cloud
Thunder-voiced, with tongue of flame.

And the rain fell full and free,
And the flowers drank their fill,
And the birds sang in the tree;

And the sun sank out of sight,
And the wind came in from sea,
'Neath God's bow with glory bright

And that night, a little frog
Sat and mused the grace of God
On an old, moss-grown log.

A Few Common Mushrooms. II.

BY MARIA L. CLOUGH.

Everyone must have seen in the grass, patches stained jet black by an inky fluid. These spots are generally due to the growth and decay of fungi of the genus Coprinus, for these toadstools at maturity actually melt away into a veritable ink of the very blackest hue the color of which is due to the presence of the black spores of the plant.

This property of deliquescence into a black fluid, is the characteristic mark of this genus, the representatives of which grow upon lawns and along the sides of streets but especially flourish in suburban waste lands and upon dumps where ashes are disposed of. They are gilled mushrooms of what may be called the " closed umbrella " shape ; sometimes, indeed, the caps are of a distinctly oval or egg form, with the gills completely hidden from sight by the closed form of the cap. Probably the best known and most valuable member of the genus is the "shaggy-maned " mushroom or Coprinus comatus. (Fig. 5.)

This delicate, evanescent plant may be found freely hereabouts from late summer until time of killing frosts and also may occasionally appear in the spring. Clusters of them may be found pushing upward through the soil of lands where ashes are being used for filling, strongly reminding one of a colony of eggs set upon end in the ground. The cap is of pearly white, in length from 2 to 7 inches and is usually marked with shaggy scales of a darker color. The gills are not attached to the stem and in color range from light flesh pink, through salmon color and purplish until they assume the inky black of maturity. The stem is white in color and hollow, measuring nearly 10 inches in length in some specimens and usually is en-

FIG. 5.

circled by a more or less perfect ring of membranous texture at a point a little below the lower edge of the cap. Sometimes this little ring is free from the stem and movable upon it. In old age the cap loses its egg-shape, cracks and becomes ragged and at length begins to be turned upward, while its edges drip with the ink from its liquifying gills.

Coprinus comatus is common and is considered one of our best edible species and indeed one need have no fear of any Coprinus for no poisonous species is known.

In the preparation of Coprinus it is recommended that the fungi be cooked with salt, pepper and butter, in a covered pan, over a slow fire for twenty five minutes and then served on toast. They are best when young, being far from tempting as food in their mature, inky condition.

In our open woods through the Summer and Fall, appear the many hued, symmetrical caps of the mushrooms of the genus Russula. They are clean looking, attractive fungi and deservedly enjoy a good reputation as esculents. They are noticeable for their peculiarly brittle texture and exhibit none of the woody and leathery consistency noticed in many fungi. In color the gills, the flesh of the cap and the stem are ordinarily pure white or yellowish, but the upper surfaces of the caps of the various species exhibit a wide variety of tints including red, purple, yellow and green. They show no signs of any veil about the gill surface or of any ring about the stem. They have short, stout, brittle stems, filled with a spongy matter within. In the young state most russulae have somewhat hemispherical or globose caps which usually become flattened with advancing age and finally the edges curve upward somewhat cracked, leaving the center of the cap considerably depressed, and exposing the gill surface to view from above.

Russula Virescens or Greenish Russula (Fig. 6) is a good representative of the genus, is not uncommon and is a good edible species. The surface of the cap is distinctly greenish, sometimes a bright bluish-green but more often of a more obscure or grayish green and sometimes verging toward brown but usually

retaining a trace of green. The color is mottled or in patches. The cap is at first globose in shape, then nearly plane and at length flattened in the middle. The flesh of the cap, the gills and the stem are white. The cap may measure five inches in diameter. Its gills are free from the stem which is solid though spongy within. Roasting or frying crisp in a hot buttered pan is considered the best method of preparing this mushroom for the table.

FIG. 6.

Russalae never exude a milky juice as do the Lactarii to which they bear some resemblance. Their worst failing seems to be their attractiveness for insects. It is difficult to find these fungi uninfested by these pests, but the ardent mushroom eater soon learns to be as philosophical in this regard as is the cider drinker. Among the Russulae the only species to which suspicion of harmfulness attaches are those which have an acrid taste and it is never well to use any Russula for food which has not been tasted and found to be of milk flavor.

In hard wood growth one may sometimes find growing upon the stumps or trees the beautiful salmon-pink and sulphur yellow masses of the Polyporus sulphureus, (Fig. 7.) A glance at the under surface of this fungus will introduce the student to a new family of fungi — the Polyporeceas — or pore bearing fungi. All of the species heretofore described with the exception of the puff ball belong to the family Agaricaceae or gill-bearing fungi. The Polyporii bear their spores or reproductive bodies upon the interior surfaces of minute tubes whose mouths form pores upon the under surface of the plant; while the Agarics bear them upon the surfaces of their gills.

The sulphury Polyporus requires but slight description as there is no danger of mistaking it for any harmful species, indeed, pored fungi growing upon trees form a safe class of fungi for the beginner. This Polyporus grows from its "host" tree

in bracket form or in more or less formless masses with little or no stem. The upper surface is of a salmon color while the under or pore surface is of the most brilliant sulphur yellow. Sometimes the caps so closely overlap that the pore surface becomes inconspicuous. As an article of food it is agreeable only in its earlier stages, soon becoming hard and woody. It should be prepared by cutting into small pieces and simmering until tender in a dressing of milk, butter and a little thickening.

FIG. 7.

All the species of fungi described in these papers have been gathered, cooked and eaten by the writer, and specimens of all ought to reward the search of any persevering student in the course of a single season. Even at the risk of boring the reader it seems advisable to reiterate the warning already given to the prospective fungus eater. Never to make any use of any fungus which has about the base of its stem a membranous cup or volua or any tendency toward one, or which has a bulbous stem with any appearance of scales upon it. In a later stage of knowledge this rule may be subject to qualification but at present it should be implicitly adhered to.

A popular notion more or less common that the white pine (Pinus strobus) fruits but once in seven years was the cause of an enquiry a short time ago if the popular idea were correct. The writer was unable at the time to answer the question but subsequent observation discovered a tree with small cones from last spring's blossoms, nearly mature cones a year old and a few old ones two years old that had not yet dropped. That tree had fruited three years in succession. Another one had two years' cones upon it. The above mentioned idea is not correct, although it is probable that the pine, like other trees, does not bear a large crop every year.

How to Find the Constellations. II.

BY GEORGE I. HOPKINS.

If the observer has watched closely the movements of the two constellations already located, he must have noticed, not only that they make a complete circuit about Polaris every twenty-four hours, but also that they arrive at any particular position about four minutes earlier every evening ; so that he will find them in nearly the same positions on the first of August about eight o'clock, that he did a month before at nine o'clock. But as it is not yet quite dark enough at eight to make out the stars plainly we will continue to make our observations at nine.

Let the observer now direct his gaze at Polaris as the starting point, and then he can quite readily follow a line of stars curving upward and to the left until a quadrant has been described, when he will see a pair of stars of about the third magnitude. Following the curve back a little way, he will see two other stars, fainter than the rest, but so situated that, with the pair above mentioned they form an oblong parallelogram. This is the bowl of the Little Dipper, the handle being the curve of which Polaris is the end. This is the principal group of stars in the constellation Ursa Minor, or Little Bear, which contains in all twenty-four stars.

There is a beautiful mythological story relating to Ursa Major and Ursa Minor, which runs as follows: The majestic and beautiful queen of Mt. Olympus became jealous of Diana's beautiful attendant Callisto, and changed her into a bear. Some time afterwards her son Arcus, while out hunting, pursued her, unaware that she was his mother, and was about to transfix her with his spear, when Jupiter, out of deep pity, immediately transferred them both to the heavens and placed them among the constellations, as the Great Bear and Little Bear, where

he continues to pursue her around Polaris without overtaking her.

If the observer will now face the southwest and direct his gaze upward rather more than half way from the horizon to the zenith he will see a bright star with a decided yellowish tint. This is the star Arcturus and is the only single yellow star visible to the naked eye. It is the brightest star in the constellation Bootes (three syllables) and serves to mark its position. About half way from Arcturus to the zenith may be seen a number of stars in the form of a spiral and diminishing in brightness as the spiral is traced. This is the celebrated Northern Crown the brightest star of which is Alphacca.

About fifteen degrees east of the zenith may now be seen a star of the first magnitude, perhaps the brightest of all now visible. This is the star Vega. Near it may be seen two others of about the third magnitude, the three forming an equilateral triangle. This the most prominent group in the constellation Lyra, the harp. It is an interesting fact that one of these lesser stars in a small telescope is seen to be a double star, while in a large telescope each component is itself seen to be also double, so that it is spoken of by astronomers as the double double star.

"And next Boötes comes whose ordered beams
Presents a figure driving of his teams,
Below his girdle, near his knees, he bears
The bright Arcturus, fairest of the stars.
Behind his back the radiant crown is view'd,
And shines with stars of different magnitude;
One placed in front above the rest displays
A vigorous light, and darts surprising rays.
This shone since Thesus first his faith betrayed,
The monument of the forsaken maid.
Nor far from these distended Lyra lies,
Well strung, the sounding glory of the skies.
This Orpheus struck when with his wondrous song
He charmed the woods, and drew the rocks along;
When Hell obeyed, when Death resigned her chain,
And loosed his dear Eurydice again.
This gained it Heaven, and still its force appears,
And then the rocks it now draws on the stars.
The planets dance, and to the tuneful sound
The Heaven consents, and moves the fatal round."—*Manilius.*

NATURE STUDY.

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A Few Common Mushrooms. III.

BY MARIA L. CLOUGH.

The beautiful branching masses of the various species of "coral-fungi" are familiar to every frequenter of the woods. They are representatives of still another of the great fungus families — the Clavariae — the members of which bear their spores upon the bare surfaces of single club-shaped growths or upon the branches of coral-like or tree-like masses. It is hardly possible to confound these coral fungi with those of any other class, and as no poisonous species is known among them, they are quite safe for the beginner. A typical representative of this family is depicted in Figure 8, and very little description is necessary. In the young state, when in perfect, tender condition any of the Clavariae which have a pleasant flavor may be used for food and they will usually be found free from the ravages of insects. The forms ordinarily met with are of a whitish or yellowish color with the tips of the branchlets often tinged with some deeper shade. Preparation for the table is by frying with butter or oil, well seasoned and serving upon toast.

There is one mushroom, so famous as an esculent, among

mycophagists the world over, that it ought not to be excluded from even the present brief and unsystematic sketch. This is the renowned Chanterelle or Cantharellus cibarius (Fig.9.)—a favorite and easily recognized member of the Agaricaceae or gilled mushrooms. Its habitat is in shady spruce and hemlock woods or among deciduous trees in damp weather, where it may be found under favorable conditions from June to November, though seldom found in large quantities. Chanterelles are handsome egg-yellow mushrooms, somewhat of a funnel form with caps of two to four inches in diameter, smooth in surface and usually of a somewhat unsymmetrical form. In the early stages the cap is convex or flat, but later it usually becomes slightly concave. The stem is generally rather shorter than the diameter of the cap and one quarter to one-half an inch thick and often curved or crooked. It is rather lighter in color than the cap and is smooth and solid. The flesh is white. It is the gills that are the most characteristic part of the plant. They are egg-yellow in color like the cap and differ markedly from the gills of the agarics which have previously been described in being thick, shallow and blunt-edged instead of thin, deep and membranous and they are further characteristic in their manner of branching into and connecting with each other causing the gill surface to present a wavy and vein-like appearance. The gills, too, continue far down upon the stem where they gradually taper away and are finally lost to view. If one remembers its two chief characteristics, a full, rich yellow color and gills resembling swollen,

FIG. 8.

branching veins, there should be no possibility of a mistake in dealing with this fungus. As the chanterelle is rather tough when raw, besides having a pungent taste, it requires considerable cooking. They should be slowly parboiled in a covered dish containing a little butter, over a very slow fire, until tender.

FIG. 9.

In the last paper was illustrated and described one of the family Polyporaceae, the Polyporus sulphureus, as typical of the tree-inhabiting polypori. It is here desired to introduce the reader to another very interesting and numerous division of the family, the boleti (FIG. 10). They are polypori which ordinarily grow upon the ground and which are provided with distinct and nearly central stems. They are of the regular umbrella shape and roughly resemble in outward appearance the gilled mushrooms, but the under surface of the caps of the boleti will be found to be made up of minute pores which are the mouths of countless downwardly pointing tubes from which the spores are distributed. The boleti differ from the rest of the polypori in the softness of the flesh of the cap and the readiness with which the tubular spore-bearing portion may be separated from the solid substance of the cap. They are a very valuable group gastronomically, but unfortunately, this fact is known in the insect world, rendering it difficult to obtain uninfested specimens for the table. Boleti in the very young state are button-shape; later the cap becomes less convex and finally nearly flat. The spore-bearing surface is generally somewhat convex downward, giving the plant a cushion-like form. The stems are usually stout and tough in texture. They are chiefly found in the woods. Until quite recently a number of species of the boleti have been regarded as deleterious, the stigma especially having attached to those with

bright red pore surfaces and those whose flesh possesses the remarkable property of changing color when exposed to the air through fracture. Now it is beginning to be believed that the group contains no poisonous species though some are bitter and unfit for food. Captain McIlvaine has said : " All the boleti are harmless though some are too bitter to eat." Boletus granulatus is common hereabouts, is an undoubted esculent and is fairly representative of the boletus group whose species number among the hundreds. In this species the cap is from two to four inches in diameter with a glutinous surface when moist. In color it is ordinarily grayish-yellow or tawny, though quite subject to variation. The tubes are at first very pale yellow and become rusty with age, and their mouths are usually found to be dotted with minute granules produced by the drying of the juices of the plant (whence the name granulatus). The stem also shows minute granules. In length it varies from two to three inches and in thickness from one-third to one-half inch. This fungus may be looked for from July to October in pine woods are groves. Boleti, if fresh and uninfested by insects, may be prepared for the table in the same manner with most other fungi, except that the slimy tube-stratum had best be removed and the caps peeled.

FIG. 10.

In these papers which are now brought to a close, systematic treatment has obviously not been attempted. The species described have been selected on account of their common occurrence, their easy identification, or their particular usefulness or harmfulness rather than through any rational connection among them, but it is hoped that by calling attention to well-marked and easily collected species the reader may be stimulated to appreciate the opportunities which the study affords and be led into other than superficial work along the line of Mycology.

A Bird Lover's Notes and Queries.

THE SEA PINES, WEST CHOP,
MARTHA'S VINEYARD, MASS.

DEAR "NATURE STUDY": Prompted by my success in luring birds with suet and beef bones to my winter home, I tried to spread as tempting a diet for the summer song birds at my seaside house. Early in April I planted a triple row of sun-flowers fifty feet long in plain view of the veranda. Of these I selected those varieties which would ensure me a continuation of bloom, and which consequently offered early and late seed heads to the finches. In my trunks I brought ten pounds of hemp and sun-flower seeds to be used as food until those planted should ripen. My third lure was to turn the hose daily on to a certain part of the lawn, where the soil was richest — for you must know this island is very sandy and with few brooks and springs. This was for the benefit of the robins when on a worm hunt. The fourth thing I did was to establish a public bath where it could be seen from the veranda. This consisted of an ordinary soup plate, with pebbles enough in the bottom to keep the birds from slipping on the glazed surface. The sun-flower seeds I scattered sparingly at night down a path that leads by the soup plate to the huckleberry patch. This I did early in June, for I had heard the shy chewinks hopping around in the bushes under the pines, and wanted to make them come out of hiding. After having assured myself that the sun-flower seeds distributed at night had been eaten, I strewed them each day nearer and nearer the house with the effect that both male and female chewinks came to them more and more boldly, until at last they hopped up the steps, eating peacefully all the way, and following the stream of seeds until it ended in the fountain head, a cigar box full to the brim, which stood on the veranda. This box is only six or seven feet away from the front door and not more than three or four from where the family sits all day. The

birds have grown so tame that the slamming of the screen door only causes them to hop off the veranda on to the steps or lawn. On July 3, the female, which is a rich brownish chestnut above, where the male is black, but which otherwise has the same coloring as her mate, arrived with three well-grown little ones at the cigar box. These were practically chestnut all over, the belly being a dirty white, and had not the strong dividing line across the breast which both adult male and female have, where the head and throat color stops suddenly and the white of the belly begins. Neither did the little ones have the intense rufous sides of the adults, but the white tail feathers were distinct. Later, on the same day, the male appeared with two much smaller birds in his care. These had hardly lost their yellow line from around the edge of the bill; were not strong enough to crack the seeds themselves, so the attentive father did it for them. Something dire and dreadful happened to one of the father's flock, for ever after he appeared with only one chick. Some of the interesting things noticed about this family I have jotted down in my note book, hoping some member of the Ornithological Section of the Institute can explain them to me, and I here elaborate these notes with this hope in view. The male chewink never took a bath, that is, in public. The female took one daily and showed the three larger children in her care how to be cleanly, and we often saw all four in the soup dish at once. The male never initiated his charge into the mysteries of the bath. There was no communication between the two groups of birds. The mother and her three never noticed the father and his one little one. They would all feed from the seeds in the path at the same time, each completely ignoring the other branch of the family. Once only I saw the father give one of the older birds of the female's brood a seed which he had shelled. I saw the mother once fly at the smallest bird in anger. The male never noticed in any fashion the mother of his five children. The female was rid of her little birds sooner than the male was of his, but for the week that the father alone was busied in feeding his charge he never noticed the mother, or the birds

now emancipated from her care. Finally he thought it time to free himself from nursery cares, and he flew in anger at his charge, pecking the little bird fiercely when he stood by squeaking and peeping to be fed. This action said, "Big baby, go and feed yourself," as plainly as though it had been put into Atlantic Monthly English for my better comprehension. Now that all the young birds were able to forage for themselves they came regularly to the cigar box, and the father and mother began shyly and coyly to notice each other again. August fourth I saw them standing one on each side of the cigar box (by this time well warped, and standing unsteadily on the curved bottom) and rocking and balancing themselves as amicably as though reunited after a divorce. August fifth the male took his only bath for the season (this abstemiousness at the beach, where all human beings set him quite a different example.) The female bathes regularly, and has very lively fights over the soup dish with the robins who come to dig angle worms from the wet spot on the lawn. The robin uses the bath, which the chewink thinks is her especial property, so she flies at the robin and tries to drive him out, and when she succeeds, in she jumps herself only to be driven out by the returning enemy who always wins in the end, because he is the larger bird, I fancy. The sun-flowers planted in the long row are now (Aug. 8) in seed, and the goldfinches have come to them, although, until these seeds matured we never had heard or seen a goldfinch in our vicinity, though they were numerous enough in other parts of the island. Now there are six or eight of them feeding all the day there. That the chewink appreciates fresh vegetables after a winter of dried ones is shown by the fact that the cigar box with the seeds of last season is entirely deserted for the sun-flower bed where the goldfinches drop many of the new seeds on the ground, spreading a handy and bountiful table for the now reunited Mr. and Mrs. Chewink. Will someone tell "Nature Study" if it is the universal custom during the season when the little ones have left the nest, but are not able to forage for themselves, for the

parent birds to ignore each other? Did the male sit on the eggs of the second brood—or were there two belated eggs in the first brood which he hatched out? The difference in size between the two sets of young birds was marked—the female's charges must have been two weeks at least older than the male's. We know there has been but one pair of birds visiting us — for the female had a peculiar broken white feather in her tail which made her easy to be identified. We have never seen two adult females or two males at our feeding spot, though this island swarms with them — their "Whip Tom Kelly-elly-elly" is to be heard on every hand. The goldfinches have begun to flock to us, on the contrary; we often have a dozen or fifteen at once — with but few females, however. Some males are still singing wildly and deliciously on August 8. Are there, then, some females sitting on the nest still, and have some pairs not yet finished a surely belated wooing?

A Pinfeather Ornithologist.

The Evening Primrose.

BY GRORGE BANCROFT GRIFFITH.

Ah, is she touched by some wand'ring sprite,
When her luminous blooms flash out at night?
As a happy boy, in the summer's prime
I have drank of her beauty many a time.

Those fragrant petals that breathed of hope,
Of consciousness, to my fancy's scope,
In that twilight haunt, — I see them still,
By the open door of the ruined mill.

The fluttering moth that hovered nigh
The bending tufts, and the zephyr's sigh,
When the vesper chimes seem to rise and fall.
In the twilight's gloom I oft recall.

And the Evening Primrose ever will be
A floral mystery unto me;
With its luminous galaxy lit at night
To win the eye of some eager sprite.

A "Cowshed" Hunt.

BY SUSY C. FOGG.

On the morning of August 10, our genial professor, followed by his little flock, started for a tramp along "Six-mile Creek." Today we numbered eleven, two less than the usual "thirteen," which, nevertheless, had proved the luckiest of numbers on former excursions, and, in spite of the over-ardent rays of the sun, we were full of enthusiasm, for were we not going in search of—well, "cowsheds," a name that gave no hint of its meaning to the uninitiated!

After leaving the highway of dust and commonplace travel, we made our way through a pleasant thicket of Goldenrod, Joe Pye weed, Asclepias and Sweet-bush clover, that grew high above our heads, and among these gay stalks, which clothe every hillside and wayside during this month of fullest summer, were swarms of insects, rioting over the feast of sweets.

Never were the Pennsylvania Soldier beetles and Ambush bugs in such abundance. The Soldier beetle (Fig. 1) is one of our diurnal fireflies. Its wing-covers are raised high in flight, and it is an active and conspicuous insect of a half inch or more in length. Its color is a dingy yellow with the thorax and lower half of the wing-covers marked with black, and rings of black and yellow encircling the abdomen.

(FIG. 1.)

In marked contrast to the life habits of the Soldier beetle are those of the Ambush bug (Fig. 2). He is predaceous and depends upon his shrewdness and the matter of concealment to get his living. The thorax and abdomen are expanded, giving the insect a grotesque appearance, and are green, broadly banded with black or brown. The front legs are abnormally developed and strong enough to seize the unhappy victims which come within his reach.

Coming from the thicket, we walked along the bank of the

creek, which, farther on, is hemmed in by high walls of shale. Its bed was full of music and strewn with small rocks. You have all seen such streams among the mountains, and for the moment the temptation would come to us, as to other boys and girls, of "stepping stones," of forgetting that we, too, had traits like unto the Ambush bug, and allowing God's life to pass unmolested.

Then we came upon a clump of the Round-leaved Cornel, or Dogwood, a species with green branches, dotted with brown, and large, round and abruptly pointed leaves, which are the largest, indeed, of any species of Cornel. Around the forks of the branches we noticed small deposits of sand or clay, and on the under side a tiny opening, which served as a door, and through this could be seen the curious little faces of the ants, peering out to see what was going to happen as their "cowshed" was being slowly turned upside down. For surely we had come upon the "cowsheds," but where were the cows? One of the sheds had been broken into, and inside, huddled close together on the branch, was a group of green aphids, of all sizes, snugly housed, and living upon the juices of the shrub, which are extracted by their sharp beaks. This juice provides the aphid with sufficient food and, after passing through chemical changes, is excreted, either through the natural duct or through small tubes or horns upon the back of the abdomen. The ants are extremely fond of this secretion, called honey-dew, and make most polite advances to the aphids in order to obtain it, stroking them delicately with their antennae, providing them with shelter, and caring for them with great solicitude. This honey, probably, is the chief food of most species of ants. Huber states: "I am not acquainted with any ants to whom the art of obtaining from the pucerons (aphids) their subsistence is unknown; we might even venture to affirm that these insects have been created for their use;" and hence the popular name,

(FIG. 2.)

"cows." The ants convey the honey to the mouth with the ends of the antennae, which are enlarged and used as fingers. A small number of secretions will satisfy an ant at one time, and if the ants fail to visit the aphids often, the honey is dropped upon a leaf, where the ant may find it upon his return. If the supply of honey becomes exhausted, the ant is obliged to wait until the aphids have taken further nourishment.

The nest of the ant colony is usually built, like that of other ants, under stones or decayed wood, but sometimes in a low shrub. In this case the ant gathers material from decaying wood, forms it into a pulp, and with that builds the nest. This Shed-builder ant, which shows such sagacity, is one of our small species. It measures one-eighth of an inch in length, which is not nearly so long as the aristocratic name given him in books —"Cremastogaster lineolata." Its head and thorax are dark brown, and its abdomen black, joined to the thorax by a peduncle of two segments Examine with a lens the tiny Red ant, so called, but which, by the way, is yellow, and you will see that the slender waist is made of two knots, and these distinguish the family Myrmicidae, to which the Shed-builder ant and the little Red ant belong. The antennae. also, are enlarged at the end, while those of other families are filiform.

A "COWSHED."

Well, before we left the banks of the pretty stream and the clump of Dogwood with the little "cowsheds" which every year appear among its branches, the Ambush bug spirit of the collector came over us once more and we decided to sacrifice eleven "sheds"; otherwise, perhaps, this sketch would not have come to you with the hope to quicken the eyes and interest of any who may not have come upon the work of these tiny masons.

"Nature seems everywhere to have anticipated the inventions of which we boast."

Ithaca, N. Y.

Wild Flowers and Vandalism.

BY EDWARD J. BURNHAM.

We hear so much about clear, logical reasoning, that we are apt to lose sight of the fact that it is all too rare. It is so easy to think in a jumble, and to get our ideas confused and tangled, and so difficult to disentangle them again, that most of us fall into the habit of jumping at conclusions. Take, for example, the attitude of a great majority of people toward the wild flowers. A little thinking will show any one that a plant can be a weed only when it is out of place; the daisy, in the cultivated field, is a weed, unquestionably; but the daisy by the roadside is a thing of beauty, an object of delight to every appreciative passer-by.

The farmer is not greatly to be blamed if he fails to make fine distinctions. A day of hoeing in the field or of weeding in the garden is likely to fix the conviction that there are just two kinds of plants — those which we must encourge to grow, and those which persist in growing in spite of everything. The result is, the cultivator comes to recognize only crops and weeds, and to include nearly all the vegetable creation in the latter category. But if the farmer is in some sort excusable for his abrupt and sweeping classification, there is nothing that can be said in defense of the barbarism of those who, while professing love for the wild flowers, ruthlessly hasten their utter destruction within a considerabie radius of every city and populous village. From the appearance of the blossoms of the Shad-bush and the Arbutus in early springtime to the passing of the frost flowers in autumn, outrage and vandalism are perpetrated upon the helpless innocents of the roadside, field and woodland under pretense of affection for them.

Nor is the blame to be laid wholly upon children, or upon those who may stroll on foot for a little way into the country. A gentleman of this city, a few years ago, secured an afternoon from business and hastened away to a patch of woodland where the Lady's Slipper was wont to be found. He wished to

admire the blossoms and at the same time to watch for such insects as might visit them. A specimen or two for later examination would have been all he would have cared to carry away. Before he reached the spot, he was met by a party whose carriage was literally filled with the flowers. He went forward to find, as he expected, that the despoilers had done their work thoroughly, and Cypripedium acaule is now unknown in that locality. The same ruthless treatment is accorded to the Arbutus, the Columbine, the Laurel, the Rhododendron, and, indeed every wild flower whose beauty offers any temptation to the thoughtless passer-by.

There is a moral aspect to this matter of destruction of the wild flowers which was recently presented in a lecture at Chatauqua. The lecturer called attention to the new and higher aim of education that has come with the better understanding on the part of teachers in regard to what education really is This, the speaker said, was especially evident in what is called the study of nature. He explained :

"The old idea that it is a beautiful sight to see children gathering large bunches of wild flowers because they loved the flowers was based on an immoral principle. It is surely false training to teach a child that because he loves a thing he therefore has a right to destroy its life. If I train my boy when young that he should pull the flower and sacrifice its life and beauty to his flower love, I am doing all I can to put into his life the feeling that he has a right to sacrifice to his own personal gratification the things he loves."

A September Moth.

BY WILLIAM H. HUSE.

On September 15, or thereabouts, there will crawl from brown chrysalids lying on or near the surface of the ground, about the latest as well as the prettiest of our season's moths. The circle of existence began a year ago, when the females deposited their eggs in rings around the stems of certain lowland shrubs about eight inches from the ground. The bush almost invariably

selected in this locality is Spiraea salicifolia, variously known as meadow sweet and white hardhack. Rarely a small willow is chosen. Entomologists in other sections mention the caterpillars as living on oak, but I have never seen them on oak trees in this locality.

The eggs are arranged in a wide band about the twig, the smaller end being attached to the bark. These keep, usually without becoming stale, till the last week of the following May, when black, tiny caterpillars, covered with branching spines emerge and ascend to the newly developing leaves. They are born soldiers, for, like the processionary caterpillars of Europe, they march in order. One courageous individual braves the unknown and goes ahead. He is followed by another, and that one perhaps by two abreast. These are succeeded by the whole company of warriors, going by twos or threes or a wider column if the branch be large enough. Passing from twig to twig, they eat and grow, ever and anon discarding their old spines for new ones when the waistband gets too tight.

Unlike some bipeds who parade in like manner they are capable of inflicting real injury upon meddlers. Together with the larvae of the Automeris io they can sting with their spines, inflicting wounds that smart like the sting of nettles. So far as I know these two caterpillars are the only ones we have that are capable of causing any injury to the human flesh.

When about half grown two rows of spines along the back become brown. At about the same time the little soldiers realize that they are eating more than formerly and that pasturage is getting scarce, and like so many Abrahams and Lots they separate and seek new pastures. They are particular as to their diet, always selecting the food on which they began to feed.

If they hatch on time and grow well, by the middle of July they are full grown and measure about two inches in length. Descending to the ground they burrow a short distance or perhaps only crawl under the leaves and twigs on the surface and change to chrysalids.

Their sleep lasts about two months and then the moth known

to its friends as Hemileuca maia comes forth for a two weeks' existence. Its black, crape-like wings with the broad white band across each make it a dainty fall visitor that I always look forward to with eager expectancy and hail with pleasure. Most of our lepidopterous visitors have disappeared and, excepting the few that will live till spring, those that are about are old and faded. It is then that the little Maia flutters about over our meadows with its peculiar flight and adds a beauty of its own to the autumn landscape.

It is rarely found far from the lowlands where the females will deposit their eggs and unlike most of its near relatives is a day flier. About ten o'clock in the foornoon it wakes up and begins it daily duties. By three in the afternoon its duties are done. It has worked hard to carry about its heavy body and retires early. On leaf or twig or arching grass-blade it alights, folds its wings over its woolly body and sleeps the sleep of the innocent.

By the first of October the mating season is over, the females consult their botanies, select the most desirable specimens of Spiraea salicifolia and on the stems deposit a few dozen links in their endless chain that would soon devastate our meadows were not death ofttimes more certain than the weather.

How to Find the Constellations. III.

BY GEORGE I. HOPKINS.

Since the September moon reaches the first quarter on the second day it will probably interfere somewhat with our observations, particularly in making out the stars of lesser magnitude. Let the observer face the south, this time about eight o'clock some evening during the first week of September, and he cannot fail to notice a brilliant white star in the southwest at an altitude of about thirty or thirty-five degrees. This is the planet Jupiter already referred to in a previous article, and which the observer has doubtless kept track of during the last

two months. About ten degrees to the left of Jupiter and at a lower altitude is a first magnitude star which shows to most eyes a decided reddish tint. This is the the star Antares, which the observer will readily recall as the name of one of Ben Hur's horses in the famous chariot race. About two degrees to the eastward and downward is plainly visible another star of lesser magnitude. Near Jupiter, above and to the left, is another star second in brightness to Antares, and call Beta, the second letter of the Greek alphabet. If now we regard Antares as a center and the line joining it with Beta as a radius and describe the arc of a circle downward this curved line would pass very near three or four other stars of lesser magnitude than the two above mentioned, but so arranged that if lines be drawn from them to Antares the figure would have some resemblance to an instrument called a sextant, or a boy's kite, which is merely a sector of a circle. This is the principal group in the constellation Scorpio, which contains in all forty-four stars. Under favorable conditions, as at the top of a mountain, or on a moonless and cloudless night on the water, a line of stars can be distinctly traced downward and to the left about fifteen degrees, thence easterly about eight degrees, and then upward about eight degrees more, the whole forming a sort of staff and curve like a shepherd's crook. This crooked line of stars forms the tail of the Scorpion as represented on the picture charts.

"There is a place above, where Scorpio's bent,
In tail and arms surrounds a vast extent;
In a wide circuit of the heavens he shines,
And fills the place of two celestial signs."—*Ovid.*

About thirty degrees east of Scorpio and at about the same altitude may now readily be distinguished another group of stars of the third and fourth magnitude, arranged in such a way as to form a figure resembling a small short-handled dipper or basin turned nearly bottom upward, with the handle extending westward. This is the principal group in the constellation Sagittarius, the archer, which contains in all sixty-nine stars. This distinguishing group is called the Milk Dipper because it lies partly in the Milky Way.

NATURE STUDY.

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Ferns and Fern Allies.

BY FREDERICK W. BATCHELDER.

One day early in September I walked out to my station of elder-leaved mountain ash (Sorbus sambucifolia) hoping to find the little trees at last in fruit. No fruit had been developed, however, and I had to be content with leaves, "nothing but leaves." Near by is a wood composed largely of white pines, where I have in former years occasionally found interesting plants. On entering this wood I was dismayed at the sight presented, for fire had swept through the entire tract and desolation reigned. Owing to the severity of the drought, the flames, rioting through the thick mat of pine needles, had struck down deep into the soil so that the roots of the pines had been charred and many of the old trees were tottering to their fall. Some, indeed, had fallen and the next gale will bring down many more. I was on the point of turning back and visiting some unscathed locality when it occurred to me that it might be interesting to observe what plants, if any, had survived the ordeal of fire. A glance through the wood showed here and there scanty flecks of greenery. These proved to be located

mostly in depressions where at the time of the fire sufficient moisture was accumulated to prevent a deep burning of the soil. Yet there were other spots where green leaves might be seen though the location was such that no water could have accumulated. What were these hardy plants that could thus successfully resist drought and fire? They were ferns every time. The great rootstocks had been so thoroughly saturated with their own juices as to defy even the flames. The first leaves, to be sure, had been destroyed, but the recuperative energy of the plants had manifested itself in the production of new leaves. Some of the plants were the so-called wood ferns, Dryopteris marginalis and spinulosa, but most of them belonged to the genus Osmunda, and that species which had apparently resisted unfavorable conditions with the greatest success was the one bearing the name of good old Dr. John Clayton of Virginia, Osmunda Claytoniana. Examining more closely one cluster of thrifty leaves, I found that not only the vegetative but the reproductive energy stored in the partially charred rootstock had triumphed and several of the leaves had formed fruit in the manner characteristic of the species. A few plants of the similar species, O. cinnamomea, had also succeeded in surviving the catastrophe, but I was unable to find any fruiting leaves.

Of this genus, Osmunda, we have three species, regalis, Claytoniana, and cinnamomea, all of them abundant and showy. Nature has been very kind in so differentiating these that the amateur botanist need have no difficulty in distinguishing them. O. regalis, the royal fern, usually growing in wet grounds, has very large bipinnate leaves on which the fruiting pinnules are panicled at the summit. In O. cinnamomea, the cinnamon fern, a whole leaf is devoted to the fruit, after the ripening of which it withers. In O. Claytoniana, Clayton's fern, several pairs of the middle pinnae bear the fruit and, like the preceding, wither after maturing. Now in the plants which had thrown up fertile leaves after the fire nature seemed to have made a frantic effort to make up for lost time. Not only were the usual numbers of pinnae transformed into masses of sporangia, but several of the

adjoining pinnae were partly changed, and occasionally a row of sporangia adorned the margin of a segment.

According to the latest classification of the plants in the subkingdom Pteridophyta, which embraces the ferns and fern allies the Osmundas constitute a family by themselves, the Osmundaceae, which means simply plants resembling Osmunda, or more literally, osmundaceous plants. With a view to a closer comprehension of their relations to other families I will give the names of those which are closely allied to that under consideration. They are Ophioglossaceae, (after which comes Osmundaceae), Hymenophyllaceae, Schizaeaceae and Polypodiaceae. These five families embrace all the plants commonly known as ferns, the six other families of the Pteridophytes being very different in habit and aspect, e. g.: Equisetum and Lycopodium. So far as our own locality is concerned the third and fourth of the above-named families may be called exotic. There is no likelihood whatever that either of the filmy ferns (Trichomanes) representing the third family will be found here. As to the fourth family, the finding of Lygodium, climbing fern, is a possibility, for anything that flourishes in Massachusetts may turn up in southern New Hampshire. The tiny Schizaea has long been known as a resident of the pine barrens of New Jersey. Recently it has been found also in Nova Scotia and it is confidently expected that it will be discovered at points intermediate between these two stations. There is accordingly a reasonable hope that it will be found in New Hampshire.

For the present, then, all the local ferns may be considered as belonging to the three families, Ophioglossaceae, Osmundaceae, and Polypodiaceae. The first family contains the two genera Ophioglossum and Botrychium, the second the well known genus Osmunda and the third, of which Polypodium is the type, all the rest of our ferns both common and rare. The order in which the family names are given above indicates the order of nature, the first family containing the most ancient and least specialized forms, the third the latest and most highly specialized forms, while the second is intermediate and consti

tutes a very remarkable connecting link between the other two. I will endeavor to state briefly the most important fact bearing upon the interrelations of these families.

When a fern sets out to reproduce itself it concentrates its energy in certain cells, transforming the matter in them from mere vegetative to reproductive substance. These cells eventually become filled with spores, i. e., they become sporangia or spore-cases, and the spores when ripe are set free to give rise to the intermediate generation (prothallium) from which the next generation of spore-bearing plants will grow. Now the choice of cells in which the initial process of reproduction takes place is the chief distinguishing characteristic of the families. In the first family, which is of very ancient origin and closest to the archaic type, the sporangia are formed of cells in the interior tissue of the leaf, or hypodermal cells; in the third family they are formed of cells in the exterior tissue, or epidermal cells, while in the second family they are formed partly of the interior and partly of the exterior tissue. In ordinary language we might say, for example, in Botrychium the spores are formed in the flesh of the plant, in Osmunda partly in the flesh and partly in the skin, and in Polypodium and the rest in the skin only.

Our common Osmundas are thus seen to occupy a very interesting and important place in the evolutionary scheme of ferns and to form a transitional group between the most ancient and most modern groups at present known. A further treatment of their specific characters must be deferred to a future article.

Intuition.

BY HENRY CLEVELAND WOOD.

How does it know — this tiny hidden thing—
  Within its wilderness of tangled grass,
  The hour when Summer's languid footsteps pass,
And Southward-flying birds are on the wing,
While earth is dumb with August's silencing?
How does it know the time for purplish haze,
  Or guess the wondrous transformation scene,
Which sets the fields and forests all ablaze?
  Yet, in shrill notes, from drowsy ways of green,
Breaking the spell that passing Summer sways,
The cricket first proclaims the Autumn days. — *Ainslee's Magazine*

Blanding's Box Turtle In New Hampshire.

BY WILLIAM H. HUSE.

When the paper on the turtles of New Hampshire was written for the June number of NATURE STUDY I supposed that the six species there enumerated were all that were found in the state. On the 23d of that month there was brought to me a specimen of Emys meleagris, or Blanding's box turtle. It was found in the southern part of Manchester near Cohas brook.

Dekay, in his Natural History of New York, published in 1842, says that this tortoise was found by Dr. Storer in Haverhill, N. H., but in Storer's report on the reptiles of Massachusetts he speaks of a specimen being sent to him from "Haverhill" in such connection that it is probable that he meant Haverhill, Mass. If this opinion be correct the specimen brought me last June is the first one found in New Hampshire of which there is any record. The turtle I have is a male. The shell measures seven and one-half inches long and five inches wide. The carapace is black, each plate being covered with small, light yellow spots, smaller and more numerous than those on the spotted tortoise. These are distributed somewhat irregularly, but seem to radiate from the posterior side of the middle row of plates and the inner posterior corner of each lateral plate. The plastron is light yellow with a black blotch in the outer posterior corner of each plate. The head and neck are black above and yellow beneath, this color extending back nearly to the shell. This yellow is one of the most conspicuous things about the turtle. There is quite a noticeable notch in the front of the upper jaw.

The neck can be stretched out to the length of five inches. The skin of the neck and flanks is rough, that of the legs, imbricated. The outer toes on the hind feet are without nails. The tail is rather long, much more so than that of the box turtle. In fact, the limbs, with the head and tail, cannot all be enclosed by the shell at the same time. The plastron is hinged in the same way as that of its relative, which is much better boxed. Blanding's box turtle is thought to be the connecting link between the common tortoises and the box turtles.

Two Mammoth Boulders.

BY GEORGE I. HOPKINS.

Boulders are so plentiful in most parts of New England that the sight of one seldom arouses interest or comment except in the mind of the eager geologist who is ever on the qui vive for additional information respecting them. Doubtless ignorance of their distribution is responsible for much of this lack of interest, while

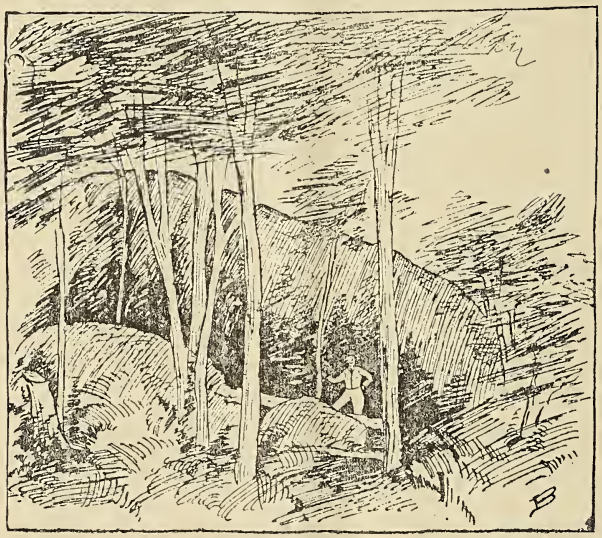


FIGURE 1.

it is also true that things or events which are of frequent occurrence soon become commonplace. It is only when a specimen of gigantic or minute proportions is discovered that the popular interest is aroused ; and so giants and midgets of the human species have always catered successfully to a curious public. This is equally true of other branches of the animal kingdom, as well as the vegetable and mineral kingdoms.

From a purely geological standpoint a huge boulder is of no

more interest than a pebble, in fact, if one could know the entire histories of the two, it may be that the interest in the latter would be the keener.

It is related of the Hon. B. F. Prescott, when he was Governor of New Hampshire, that some one expressed to him a regret that New Hampshire furnished no boulders of such large dimentions as had been discovered in other States. He, as if thinking that the reputation of the State was at stake, immediately instituted a search in the vicinity of Pawtuckaway mountain. His enthusiasm was soon rewarded by the discovery of several boulders of larger dimensions than any that had been described up to that time. Hitchcock, in his "Geology of New Hampshire," locates and describes between twenty and thirty large boulders, most of them in New Hampshire, varying in size from 26,000 to 75,000 cubic feet, but nowhere mentions the one in Londonderry (Fig. 1) nor the one in Dunbarton (Fig. 2).

FIGURE 2.

We have mentioned one as located in Londonderry, while in reality it lies on the boundary line between that town and Manchester. It is about six miles from the City Hall on the Derry road and lies in a swamp about 200 yards from the highway. It is surrounded by a small timber growth, just enough to hide

it from the view of the traveller. Although unknown to the geologists, it was well known to all the earlier settlers and their descendants, being frequently mentioned in deeds as fixing certain boundary lines between adjoining farms. Its shape is approximately rectangular, and its longest dimensions are, length 38 feet, width 35 feet, height 19 feet. It is difficult, of course, to compute its volume, because of its irregularity and from lack of definite knowledge as to how far it is buried in the swamp muck. It is believed, however, that this cannot be very far, as it seems to have been stranded on a pile of boulders of lesser size, and in all probability now rests upon them. It probably contains between 25,000 and 30,000 cubic feet, corresponding to a weight of 2,000 to 2,500 tons.

This boulder is composed of the typical New Hampshire gneiss, and presents no specially interesting features except its size. Of course, such large boulders were not carried very long distances, and one naturally looks for the parent ledges within comparatively short distances. The nearest exposed ledge to this boulder is Rattlesnake Hill, about a mile N. E. by N., and if this is about the direction of the glacial movement at this locality, Rattlesnake Hill is probably the origin of this boulder.

In the southern part of the town of Dunbarton, about eight miles from Manchester, on the Colby farm, there is another massive boulder not mentioned by Hitchcock. This also lies in a swamp, and until recently was surrounded by a considerable growth of timber. This has just been cut down, however, and the boulder now lies quite exposed. This rock is composed of porphyritic gneiss, and, so far as could be learned, rests on the deposit underlying the swamp muck, no other boulders, large or small being associated with it. Its longest dimensions are, length about 35 feet, width 31 feet, and height 20 feet. Its estimated volume from these measures and its shape is a little over 20,000 cubic feet. This corresponds to a weight of about 1800 tons. This is probably a fragment of the ledge of porphyritic gneiss that extends in a north and south direction through Weare and Hopkinton, about S. S. E. A good idea of their magnitude

can be obtained by a comparison with the figure of a man in the cut. It is possible that there are still other boulders of immense size, in this State, that have never been brought to the attention of the public. We would be glad to know of them if such can be found.

A Humming Bird's Visit.

BY THEODORA RICHARDSON.

On a recent August morning, while gathering nasturtiums, a tiny female humming-bird (Trochilus colubris) came to the garden, and seeing a mass so much larger, in one spot, she visited nearly every flower in my hand, making, at times, a clucking noise of exultation or delight.

Bradford Torrey tells of the fearlessness of the little creature, and also gives us a most interesting description of the process of feeding the tiny offspring by regurgitation.

As the little mother sat on the large wire, which surrounded the garden plot, within reaching distance, and preened her much bedewed plumage, I noted the pollen covering her long bill, and wondered how many flowers she had fertilized, while she gathered and stored the insects ready to feed her young.

Although she has not the brilliant ruby throat of the male, yet she is not without beauty, for the irridescence of her bronzy back delights the eye, shining in the sunlight with every motion; and her short fuscous tail edged with white gives her such a tidy look.

Once more making the circuit to nearly all the blossoms, she took her departure.

Later in the day, she was seen in front of the house in an apple tree, alternately perching on a small twig or flying about the rosy apples.

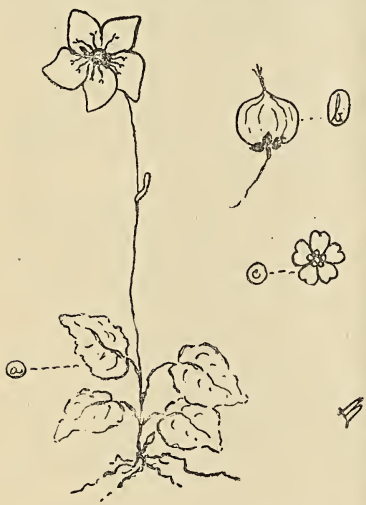
"The brain,
That forages all climes to hue its cells,
Will not distil the juices it has sucked
To the sweet substance of pellucid thought,
Except for him who hath the secret learned
To mix his blood with sunshine, and to take
The wind into his pulses." — *James Russell Lowell.*

The "Single Delight."

BY M. CLARA HAWKES.

This little plant is a dainty bit of life, belonging to the Canadian flora, found (rarely) in the cool regions of New Hampshire, in the Adirondacks, in the Rocky Mountains, and as far north as Labrador and Alaska.

It is known as Monesis uniflora. It is modest and retiring in its nature, not frequenting the wayside much, but choosing the quiet of the woods "far from the madding crowd." Its



height does not exceed four inches. Its white, waxy flower, one-half inch in diameter, droops gracefully, and it is by that only that the casual observer would see the plant, for the leaves are small and inconspicuous. The stamens of the three or four specimens found were arranged in a peculiar manner, not mentioned in the books. Some of the petals had three stamens opposite them, some had two, and some one only. It is not quite safe to state this as a peculiarity of the species, for it might have been due to some local cause not ascertained and as there were no more specimens at hand it is mentioned merely as an interesting observation.

The specimen illustrated grew on Bear Island, Lake Winnipiseogee, on a mossy bank in company with its its near relative the Pyrola elliptica. It must have had remarkable vitality to survive the changes of the cold northern climate of bleak Labrador, depending as it does on but one flower for reproduction, a habit not very common.

The little plant has had a struggle, too, to retain a name through the years of the last century and a half. The earliest name by which it was known was Pyrola uniflora, given to it by Linnæus in 1753. Later Richard Anthony Salisbury, an Englist botanist, named it Monesis, meaning single delight, and specified it as grandiflora, which name S. F. Gray used in 1821. Asa Gray, in 1848, adopted Salisbury's generic name Monesis, but returned to its old specific name, uniflora, so now we consider Monesis uniflora its proper name.

Among the Artichokes.

BY EDWARD J. BURNHAM.

A bit of city garden was planted to Jerusalem artichokes, five years ago, with the purpose of trying the effect of cultivation upon their coarse and generally neglected tubers. Five centuries might, perhaps, effect improvement, but five years evidently count as nothing in the slow processes of change.

As not infrequently happens, however, the enthusiasm of the entomologist rose as the hopes of the gardener fell. The artichoke is not fastidious as to its company, and welcomes all sorts and conditions of the insect tribe. The procession of visitors begins when the plants break the ground, and ends only when the leaves fall. Attus, the Jumping Spider, tiger cat of the invertebrate world, is early upon the ground, or rather, upon the growing stalks; Clubiona, less boldly aggressive, but equally murderous at heart, rolls a leaf and waits within; while Epeira, later, patiently weaves her orb, geometrically proportioned. Spiders, like fakirs at a fair, know where victims will most abound.

These for business; the flies come for pleasure, in numbers of species to test the patience of a Loew and drive our modern

dipterists to despair. Some in yellow, some in green, some in blue; some mimicking the dress and manners of the bees — a gay and brilliant, if somewhat unprincipled company. In contrast, the sober grasshoppers — the awkward Melanoplus bivittatus, the trim Red-legged Locust and its cousin the Atlanis — three species of one genus sometimes on a single stalk. In August the Tree Crickets, also; the males, stationary, with extended wings repeating their strident calls throughout the night, while the females roam about, seemingly indifferent to the male portion of creation in general, and to male Tree Crickets in particular. The Tree Hoppers, in great numbers, sufficiently pert with their knowing eyes; demure enough, too, until near approach, but resentful of familiarity, escaping, at the last moment, to some friendly stalk on the opposite side of the patch.

The plant lice increase as the season advances, and the black ants hasten to bear them company, stroking them with their antennae and sipping the honey dew from the tips of the tiny tubes rising from the back of the abdomen. But this complaisancy toward the gentle and harmless ant often leads Aphis to her undoing; for how shall she, all unsuspecting, perceive the treachery of the malicious Aphidiinae? The deceitful little Braconid, that looks like a fly and is not, approaches the Aphis face to face, and greets her with all fair seeming; and then gives her a spiteful thrust, straight home. It is all over with poor Aphis. One female has stung another, as happens often in insect society, and will continue to happen to the end of insect time.

But little Ned, ignorant, like many another child, of the tragedies around him, peering mid the artichokes for Tree Hoppers, has made a discovery. Holding a tiny insect in his hand, he says: "I guess it's a beetle, but it's a funny one." It is a beetle, and it is "funny" — the queerest of all the queer folk in this artichoke assembly. Thomas Say named it Anthicus monodon, and Mrs. Say drew the first picture of it. Professor Le Conte afterwards decided that it was a Notoxus; but it is just as queer under one name as another. The thorax is prolonged over the

head into a horn, so that its head is forced constantly down in what is an awkward and seemingly painful position.

We gaze long at the beetle — Ned and I. We wonder, each in our own way, why the thorax is so strangely prolonged, why the head is bent constantly down ; and as we wonder, night comes ; it is growing dark.

How to Find the Constellations. IV.

BY GEORGE I. HOPKINS.

If the observer has succeeded in locating the constellations already mentioned, and has watched them from evening to evening, he must have noticed their change of position with reference to meridian and horizon at any given time. For example, at eight o'clock on October first, the time which we will take for our present observation, he will notice that Scorpio, which contains the red star Antares, is then so low down in the southwest that none of its stars are visible except under the most favorable conditions, and that the brilliant planet Jupiter alone, now marks its position. He will notice also that the bright star Vega which has been near the zenith so long in the early evening, is now just across the meridian and is a few degrees west of the zenith. Equally noticeable is the position of Corona Borealis, the Northen Crown, nearer the western horizon, being now at an altitude of about 45 degrees, as well as corresponding changes in other groups whether named or not. It is altogether probable that some of the constellations about to be located have already been noticed in previous observations. Let the observer this time select a favorable field or tower and clear evening as near the first of October as possible, and face the south. If he will now lift his gaze steadily upward for about fifty degrees he will see a star of the first magnitude with two stars of lesser brightness, one on either side two or three degrees distant, all three nearly in a straight line. This is the principal

group in the constellation Aquila, the Eagle, and the brightest star is called Altair, another of Ben Hur's horses. Altair is one of the stars from which the moon's distance is taken for computing a vessel's longitude at sea; and when on the meridian it occupies almost exactly the same position in the sky that the sun does on the 12th day of April.

> "The towering Eagle next doth boldly soar,
> As if the thunder in his claws he bore;
> He's worthy Jove, since he, a bird, supplies
> The heaven with sacred bolts, and arms the skies."

Let the observer now direct his gaze ten or fifteen degrees to his left, but at about the same altitude and he will see a small cluster of four stars of about the third magnitude ar ranged in the form of a rhombus, i. e., an equilateral parallelogram with two obtuse and two acute angles. This form is sometimes spoken of as diamond shape, or lozenge shape. This is the distinguishing group of the constellation Dolphin, the Latin of which is Delphinus. To some this group is known by the name of Job's Coffin, but from whom, or from what fancy, it first obtained this appellation, is not known. The Dolphin, according to some mythologists, was made a constellation by Neptune because one of these beautiful fishes had persuaded the goddess Amphitrite, who had made a vow of perpetual celibacy, to become the wife of that deity; but others maintain that it is the dolphin which preserved the famous lyric poet and musician Arion, who had set sail from Italy with great wealth, from being murdered by the ship's crew. He begged permission to play a tune upon his lute before being put to death. This being granted, attracted a number of dolphins around the ship. As soon as he saw them he jumped into the sea and one of them, it is asserted, carried him triumphantly on his back safe to Taenarus.

If the observer will now lower his gaze to a point about half way from the Dolphin to the horizon, he will be able to trace three lines of faint stars, all somewhat curved, but meeting so as to form a larged-sized triangle. This is the distinguishing group in the constellation Capricornus, another of the zodiacal constellations. Again, away in the southeast, at an altitude of

about fifteen or twenty degrees, may be seen a star of the first magnitude which keeps up an almost incessant twinkling. This marks the position of the constellation Pisces Australis, the Southern Fish, and is about the only star out of the twenty-four composing this constellation that can be seen in this latitude, except on very favorable occasions. The name of this star is Formalhaut, and it is also one of the stars whose position has been determined with great accuracy to enable navigators to find their longitude at sea.

Turning now to the west and resting the gaze about half way from horizon to zenith, the observer can readily detect a group of six stars just above Corona Borealis in the form of a fanciful letter H with curved sides, and resting on one side, the lower side being longer and the upper being the sharper curve This is the distinguishing group in the constellation Hercules. This is one of the largest constellations in the heavens and contains 113 stars, all but one being below the second magnitude. A special interest clings to this constellation from the fact that it contains a point called the Apex of the Sun's Way. This simply means that the sun, with its train of planets and their satellites, is moving through space with a velocity of eleven miles per second, and that the point in the heavens to which the movement is directed is a certain point in the constellation Hercules.

If the observer will now face completely about and look toward the east, he can make out plainly, a group of stars forming a large square at an altitude of about thirty degrees, the stars being of the second magnitude. These stars are about fifteen degrees apart and so disposed, when in this position, that one of the diagonals is perpendicular to the horizon. This is the distinguishing group of the constellation Pegasus, or the Winged Horse, and is known as the Square of Pegasus, although the star in the left hand corner belongs to the constellation Andromeda, and is known by the name of Alpheratz. The star in the corner of the square nearest to the horizon is called Algenib. Pegasus, according to the mythologists, is the celebrated horse which sprung from the head of Medusa after Perseus had cut it off.

Miscellaneous Notes.

The Institute library is growing rapidly, in part from generous gifts from friends, and also through the system of exchange with other institutions. The card catalogue system has been adopted, and members will find the library of special utility and easy of access.

Copies of Number 1 of NATURE STUDY are already scarce, with the demand steadily increasing. Members of the Institute and others who received that number but do not care to preserve a "set" will help us materially by returning it. We need copies of Number 1 very badly in order to meet requests from our subscribers.

September 6, 1898, George E. Burnham captured a single individual, male, of the cosmopolitan dragonfly, Pantala flavescens, Manchester thus becoming the northernmost point in the eastern United States from which this species had been reported. No other was seen until September 17, 1900, when Mr. Burnham captured another, a female, near the same spot.

A sample copy of NATURE STUDY, Number 1, Volume I, was mailed to every member of the Institute, last June. The number of members that gave prompt assurance of support was encouraging, but there are still many who have not subscribed. To these Number 5 is now mailed as a reminder. No one is asked to subscribe merely to "help things along." Things are going along very sactisfactorily; but it is believed that matter is published in NATURE STUDY every month which members of the Institute can ill afford to miss.

The first volume of the Journal of Proceedings of the Institute has been accorded a reception that was unexpected. Requests for copies have come from botanists, entomologists, museums and scientific institutions throughout the country, and the supply is already very low. In nearly every case an exchange is offered which adds materially to the Institute library. Every member received a copy, even where several went to one family, and it would be a great help if members who have copies which they do not especially care to retain, would return them.

NATURE STUDY.

A MONTHLY BULLETIN OF THE

Manchester Institute of Arts and Sciences.

VOL. I. NOVEMBER, 1900. No. 6.

Glimpses of European Birds.

BY ANNIE V. BATCHELDER.

When, on the 19th of May last, we sailed out of New York harbor, we kept an eye out for unfamiliar birds. That day we saw only gulls careening about the steamer on the watch for whatever dainty morsel, for a gull, might be cast overboard. The next day we were well out at sea and our first new bird was at hand. Besides the few gulls which still followed us there was a flock of smaller birds having a swallow-like appearance and flight. The sailors called them sea-swallows, also Mother Carey's chickens. It was hard to believe that these frail looking creatures, scarcely larger than a sparrow, were in fact the Stormy or Wilson's Petrel (Oceanites oceanicus) which breeds in the South Atlantic and ranges the ocean thence indefinitely northward. The birds followed us for three days. They frequently alighted on the steamer and some of them undoubtedly spent the nights on board in some hidden nook. Late one afternoon a couple of them chose for their resting-place a perch just beneath the awning on deck. They snuggled up to each other, tucked their heads under their wings and remained there

all the evening. Later, they were driven away by the superstitious sailors, who regard them as harbingers of bad weather.

As we passed the lovely Azores, unfamiliar birds appeared, and others met us at the Straits of Gibraltar. Off the southern coast of Sardinia we were visited by numerous flocks of birds, many of whom alighted in the rigging. They were about the size of our bluebird, yellow, with brownish markings, and their bills were long and slender. In flight and song they somewhat resembled the goldfinch. In the absence of available sources of information we were unable for the most part to identify the oceanic birds.

While the approach to Europe by the southern route is by far the more enjoyable one it has the disadvantage, to the bird lover, of presenting the fewest objects of interest at the outset.

On landing at Naples and in journeying through Italy the ornithological fact which most impressed us was the extreme scarcity of birds. What has become of them all? Surely, in leafy June one would expect to find them in abundance. There were, to be sure, plenty of sparrows (Passer italiae), slightly differing from our common house sparrows, and a few birds of the genus Corvus occasionally enlivened the fields along the railway.

The first interesting land birds we were able to identify were at Rome, and at the Colosseum, of all places in the world. There were the Jackdaws (Corvus monedula), small cousins of the crow, noisy and familiar birds, flying in and out of their hiding places in the walls of the old Roman theatre. In size and appearance they resemble our Grackle, and they are said to be very useful as destroyers of injurious insects. We frequently observed them following sheep and cattle in the fields, after the manner of our Cow-birds. Their favorite diversion, and one which greatly entertained us, was to alight on the backs of the sheep and relieve them of certain insect pests, a bit of entomological research to which the sheep submitted not only without protest but with evident satisfaction.

Our first impression regarding the scarcity of birds in the Italian peninsula was confirmed as we journeyed on through

Florence to Venice. From Venice our course lay among the Tyrolese Alps, then through a most beautiful and fertile country, beyond which we crossed the vast plain environing the capital of Austria. Being ourselves "on the wing" or sight-seeing all through this prosperous, fertile, and well wooded country, where, by the way, forestry has been reduced to a science and where we neither saw a dead tree nor the dead limb of a tree, it was not until we reached Munich after a swift run from Vienna, that we had opportunity for further observations. The morning after our arrival we heard a loud and cheerful song, resembling in some respects that of our robin, but with a more decidedly thrushlike quality. Looking out we saw our bird perched on a chimney top. We at once recognized him as the European blackbird or black thrush (Turdus merula), corrrsponding to our robin, or, to quote Burroughs, "our robin cut in ebony." He is the merle of the English poets. As is the case with many European birds his common name, blackbird, suggests to an American a different order of birds from that to which he really belongs. Our blackbird is a starling, while that is a thrush. About the size of our robin, he flirts his tail like a true thrush, pulls up angleworms like a robin, and scratches among the leaves like a thrush again — a sort of thrush-robin or robin-thrush.

At this city we also made the acquaintance of two of the common European birds, the swallow (Hirundo rustica) and the swift (Cypselus apus). The common European swallow looks very like our barn swallow, having the same long quills in the outer tail feathers, but, unlike ours, he builds in chimneys. The swift, curiously enough, does not build in chimneys but on cliffs or walls, like our eave-swallow. These swifts are larger than ours and have a respectable tail in place of the "paint brush" apology for that appendage owned by their American cousins. The sounds they utter are also different, not a rapid chatter, but, in the words of Mr. Ralph Hoffmann, "a curious screech, fine and rasping, resembling a bat's squeak."

On the 15th of June we invaded the mysterious precincts of

the Passion Play. This was the most impressive experience of the whole tour, from the combined effect on our minds of the scenery, the quaint and peculiar people, and the superb presentation of their hereditary thank-offering.

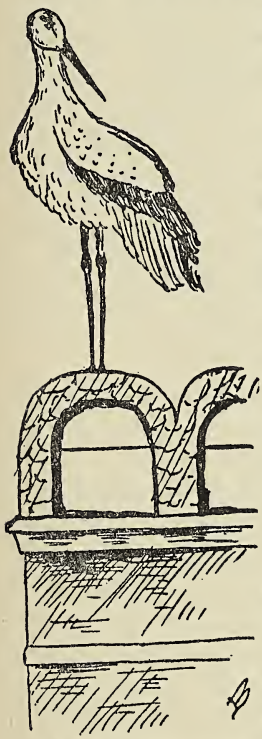
Here two of the most charming birds in Europe introduced themselves to us. The first were perched on telegraph wires and but for their heads having a tinge of lemon yellow we might have taken them for vesper sparrows. These were the famous yellow-hammers (Emberiza citrinella). The song is insect-like and thin but not unmusical, and is heard at a considerable distance. On the afternoon of our arrival we drove out of the picturesque little village by the road which follows the winding Ammer in its course through the narrow valley overhung by the Bavarian Alps. This clear, swift flowing stream gives the name to the town, Ober-Ammergau. While crossing one of the bridges which spans it we observed some brownish-black birds, with distinctly rufous tails, which they tilted frequently, and displayed by opening and closing like a fan, after the manner of our redstart. In fact they turned out to be the black redstart (Ruticilla titys), not, however, related to our redstart, which is a warbler, but nearer our thrushes. Bird life is evidently abundant in the narrow little valley and in the town itself. During the progress of the Passion Play all sorts of weather prevailed, mountain showers, wind and sunshine, and to add to the uniqueness of the scene numbers of wild birds flew about the auditorium.

The song of another bird, as yet unseen, had come to us at Munich. It was much like that of our purple finch or linnet, a little louder and more broken and with a questioning inflection. At Lucerne, while taking our first look at the famous Lion of Thorwaldsen we heard the song again and, following the little fellow as he flew from tree to tree up through the Glacial Gardens, we soon had an excellent view of the bird. He was about the size of our linnet, head ashen, like that of the male house sparrow, back brownish, rump yellow, throat rufous, breast vinous red, belly white, wing bars prominent. This we identified as the chaffinch (Fringilla coelebs). These

beautiful and sociable birds became our constant companions from this time on.

From Switzerland we entered Germany again at Strasburg proceeding thence by way of Heidelberg and Mainz down the Rhine to Cologne.

Soon after leaving Mainz by river steamer early in the forenoon of June 28, we espied in a village on the east bank several most singular looking nests perched on stilts on the tops of chimneys, the stilts evidently provided by the hand of man to elevate the nests so far above the summit of the flues as to give room for draught. Soon we saw some large heron-like creatures perched about one of them and we knew to our delight that we at last saw with our own eyes the famous fortune-bringing Stork (Ciconia alba), the theme of romance and folk-lore for ages unknown. Nothing yet had struck us as so foreign as these great birds. Folks looked natural if they didn't talk natural; scenery could be matched at home; the stork reminded us forcibly that we were foreigners. Blessed be the storks, beloved of German hearts, bringers of babies and all sorts of good luck!



No new birds appeared through Holland and Belgium, and in the short time we spent in France we were impressed that the country was not so well "birded" as Switzerland, Germany and Holland. Perhaps Parisian milliners may be in part responsible. It was when we passed over to England that our eyes and ears were gratified with evidence of a larger bird life, undoubtedly the result of a closer sympathy with the rest of the animal creation among the English peo-

ple than prevails in France. The reputation the English have acquired as destroyers of game birds had led us to expect a scarcity of other birds. Quite the contrary was the fact. The island is alive with birds from Folkstone to Peterborough, the "Land's End and John O'Groat's" of our tour. Taking a circular tour in the midland district we passed through the edge of the old fen country. Between Ely and Peterborough we saw large flocks of lapwings (Vanellus cristatus), plover-like birds which go in companies in search of their favorite diet of earthworms. Two sturdy yeomen in the coach with us showing a disposition to be sociable, we asked them about the birds. One said they were a kind of plover. The other tossed the remark over his shoulder that when he was a boy they called them "Pe-weest," to which the first added that some called them lapwings. This was in itself sufficient identification, as we found afterward when we compared our notes with the textbooks. The birds were about the size of pigeons and had glossy green backs and white bellies. When on the ground their movements are rhythmical and graceful; in flight, owing to the peculiar conformation of their wings, they are awkward, almost bat-like.

One lovely day, never to the forgotten, we took a trip out of London to the favorite haunt of Dutch William, otherwise known as "of Orange," or "the Third," Hampton Court. We could easily see how the place would suit his majesty, fresh from the flats and dykes and windmills of Holland. It is much more beautiful and much less Dutchy now, than it was then, for William's horse chestnuts have become old trees, grand with the accumulated majesty of two centuries. Such a sight is the springtime blossoming of these ancient trees, that the announcement of it is made annually in the London papers for the benefit of the public, who come in crowds by rail or boat to enjoy the sight. The place was full of birds. The summer quiet being on them we heard few songs. It was here in this home of romance and royalty and art that we saw our first true robin redbreasts (Erithacus rubecula). Shy, yet not nervous

they popped out of the hedgerows, those blessed English substitutes for ugly walls and fences. They seemed to say, "You don't see us in America, do you? Well, you shall have one good look at us; but be quick about it!" and into the hedgerows they popped again. We were grateful to them for their friendliness, and it was pleasant to think that their ancestors had looked upon Wolsey and great Harry and good Queen Bess and those that followed them.

STORK'S NEST.

One more bird and my story is done. A cool, breezy day in late July saw us on the road from Salisbury to Stonehenge by way of the quaint village of Amesbury, with its little church where Tom Pinch played the organ to the great satisfaction of his master Pecksniff. On our return from the site of Druidical worship some birds rose from the ground and mounted spirally upward. Suddenly we heard a song far above us. In transport we asked our driver what the birds were. "The skylark, Mum," was the reply that thrilled us. We looked in vain for the singer. He was hidden in space as if he were etheralized, his little body molten into a chain of song. The musician of the family questioned if the song itself would have been so remarkable if divested of the charm of mystery and distance. It is useless to attempt a description of the song. Amid those new and rich associations, where history and legend and poetry combined to lift our souls to heights hitherto unscaled, the bird's song transcended thought. Thus we left England with fewer regrets, for the song of the skylark was in our hearts.

Ebenezer.

BY WILLIAM H. HUSE.

It is a long name, but his scientific name is longer and the possessor was longer than both by several inches. To scientists he was known as Eutainia saurita; to his neighbors he was a striped snake or, more properly, riband snake, for there are two species that are called striped in this locality.

One day in June a boy brought him and a companion to me and they were placed together in a cage. Ebenezer, who never objected to his name, although he never answered to it, was the brighter of the two and the more voracious. He was usually hungry and got the lion's share of the supplies from the commissary department. It is interesting to watch a snake swallow its food. With no hands or feet to assist in the process it manages to hold and enclose a frog or fish of greater diameter than itself with apparent ease. The jaws are provided with small teeth that serve to hold the prey. The mouth is worked forward, a side at a time, one side holding on while the other is pushed ahead, and so on alternately until the whole animal is out of sight and then the muscles of the throat contract and force the food down to the stomach. I soon discovered that snakes wanted water regularly, drinking much like a horse with the nose or sometimes nearly the whole head immersed.

One day Ebenezer's companion escaped and he was left alone with a green snake. This proved to be a female and during July became somewhat corpulent, growing more and more so until eleven eggs showed their presence and size by distending the skin so that their shape could be plainly seen. Unfortunately an accident happened to her before the young were much developed and the eggs were preserved in formalin.

Ebenezer soon became perfectly tame. He was always gentle. His voracity never forsook him. He ate frogs with avidity He was equally fond of toads, which I did not catch when I could get other food. Tadpoles and small fish he would eat when he could not get frogs. I could never induce him to eat

insects. One day he showed an apparent choice of food that was of interest. He had had nothing to eat for several days when a pickerel frog was introduced but was not eaten. It remained in the cage till it died and dried up for lack of water without being touched. Several days later another was placed in the cage. Ebenezer had now fasted for about ten days and was hungry. The frog was seized at once and as promptly released. Again, he was captured and rejected. The third time Ebenezer's hunger prevailed and the frog was seized and swallowed, but rather slowly. It looked a little as if snakes might have the sense of taste which is denied them by some.

Another incident indicated more intelligence than I supposed Ebenezer or any other snake possessed. He had seized by the side a frog a little larger than any other he had ever attempted to swallow. The mouth was worked back to a hind foot and the process of swallowing began. When the body was reached the other hind leg doubled up beside it and made too large a mouthful. Ebenezer slowly disgorged the leg until he had hold of the foot only; held that while he seized the other and then proceeded to swallow both legs and the rest of the frog.

Ebenezer spent the month of August at the beach going over the road between Manchester and York four times. When taken out for exercise on the sand he showed his tameness by making no attempt to get away but crawling slowly towards me as often as in any other direction. About the 20th of August he shed his skin. His colors had gradually grown duller and finally the milky hue of his eyes showed that the change was near. One Sunday morning he began rubbing his nose against everything he could find in the box until the old skin began to peel off at the nose. When about two inches had been worked back and off I took pity on him and held him where the old skin was turned back while he crawled out and left it turned wrong side out and somewhat longer than before. He was a beauty in his new dress. The black was jet and velvety; the yellow was bright and glistening.

But alas, poor Ebenezer! All is mortal here below, with

snakes as well as men. One day the glass cage which he called (or might have called) home was placed in too much sun with too little water inside and at night Ebenezer was dead. His loss caused real regret, for his pretty colors and gentle and interesting ways had dispelled in more then one person that unreasonable and foundationless horror of all kinds of snakes, that are mostly harmless, shy and beautiful.

Ferns and Fern Allies. II.

BY FREDERICK W. BATCHELDER.

When Asa Gray was a young man he was in the habit of testing his powers of observation in various ways For example : when tramping through a wood he tried to distinguish the different kinds of trees by the bark alone with the result that he was before long able to name all the species without seeing either leaves, flowers or fruit. This was a reduction of the data for diagnosis to the lowest terms. Neither was the method altogether a negative one. Any object to be distinguished from other objects must have some individual character of its own. It is one thing to know all about a given species of plants and quite another to know enough about it to tell what it is not. Yet even the latter bit of knowledge is better than none, for it invariably begets the desire to know more. So I do not hesitate to say that the ability simply to tell the three species of Osmunda apart is, so far as it goes, a scientific acquirement and worth a great deal more than the effort necessary to its attainment.

FIG. 1.

The Osmundas are so very abundant that one does not have to search long to find them all. There is no difficulty in distinguishing them in spring or early summer by the methods of fruiting, O. regalis bearing the fruit at the summit of the leaf, Claytoniana in the middle, and cinnamomea having an entire leaf changed into fruit. After the fruiting portions have

withered there is still no difficulty in naming the royal fern, for the large compound leaves are characteristic. With Clayton's and the cinnamon ferns the case is different. The sterile leaves do appear to the unpracticed eye very similar. Continued observations will soon reveal subtle differences and it will bring positive pleasure to the patient observer when these little points so arrange themselves in his mind that he at last sees them clearly and wonders that he ever could have missed them.

The leaves in both species rise in a circle from a massive rootstock. Those of the cinnamon fern are more apt to be erect and to have the pinnae of the two sides somewhat inclined toward each other. In Clayton's fern — with all due respect for the memory of Dr. John Clayton, I wish Michaux's name, "interrupted fern," might have been retained — the sterile leaves are inclined to droop backward, sometimes almost to lie on the ground and the pinnae usually spread out in the same plane on both sides of the rachis or continuation of the leaf stalk.

FIG. 2. A peculiarity of the fertile leaves in this species is that after the spore bearing pinnae have withered they straighten up so strenuously that they bend over backward as if overcome with pride by reason of the successful accomplishment of their reproductive function.

There is also a difference in the color and texture of the leaves. Those of the cinnamon fern are mostly thicker and more coriaceous (leathery) than those of the other, and to offset this the leaves of Clayton's fern are so flattened and broadened out that they present a greater amount of surface to the light and air. In regard to color the difference is more easily seen then described. I fancy that the green of Clayton's fern is of a slightly bluish and that of the cinnamon fern of a yellowish cast. There is also a difference produced by the fact that the leaves of the latter are glossy while those of the former are without lustre. The color of the royal fern, by the way, is decidedly bluish.

FIG. 3.

As regards the divisions and subdivisions of the leaves of ferns the nomenclature which expresses them is quite puzzling. It is no disgrace to find these terms meaningless at first. The only disgrace is in not caring to make the mental effort essential to comprehending them. It is not half so hard as it seems to be to master a class of unfamiliar terms when they are so rationally and logically employed as they are in the scientific work of this closing year of the nineteenth century. One does not have to be a Latin scholar to know that "bi-ennial" means "two-yearly"; neither need he in order to know that "bi-pinnate" means "twice pinnate." All the trouble comes in the beginning. The mastering of the first dozen jaw-breakers gives confidence for all following struggles and the monsters soon vanish like morning mists.

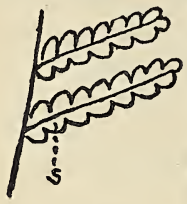


FIG. 4.

The leaves of the royal fern are said to be "bi-pinnate" (Fig. 5) because each pinna (branch) is divided into several "pinnules" (branchlets). Those of the other two species would be called "pinnate" (one-branched) were it not that the branches themselves are almost cut to the midrib, so an intermediate term has to be used expressing this approach to the twice-branched form. This term is "bi-pinnatifid" (Fig. 4). To go farther, some ferns have leaves that are thrice divided; accordingly they are termed "tri-pinnate"; and a form between this and bi-pinnate is called "tri-pinnatifid," meaning almost thrice-branched.

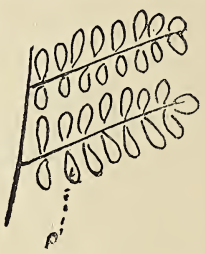


FIG. 5.

Our three species of Osmunda fortunately require only two of these awkward terms. The royal fern has bi-pinnate leaves only; the cinnamon fern has the fertile leaves bi-pinnate and the sterile ones bipinnatifid; Clayton's fern has only bi-pinnatifid leaves.

There are six known species of the genus, three only growing in America. O. regalis is almost cosmopolitan, being found in America, Europe aud Asia and Southern Africa. O. Claytoniana occurs in America and India; O. cinnamomea in America only.

As noted in the previous article this genus occupies a particularly interesting position in the evolutionary scheme of ferns, standing as a connecting link between those ancient forms which initiate the process of reproduction in hypodermal cells and those more modern forms which initiate the same process in epidermal cells. The former are technically termed "eusporangiate," the later "leptosporangiate" ferns.

But it is in the study of Clayton's fern that one of the most marvellous series of observations on record even in this day of scientific marvels has recently been accomplished. Certain conformations of the reproductive organs in the genus Osmunda make the plants exceptionably favorable subjects in which to observe with the microscope the reproductive processes. They were accordingly chosen by Prof. Douglass L. Campbell of Leland Stanford University, for special microscopic study, as likely to aid him in his critical studies of the mosses and ferns. He was in the end rewarded by seeing what the eye of mortal man had rarely seen before, had never seen in this class of plants, the whole process of fertilization and the growth of the new individual from a single primal cell! (For the particulars of this observation see Campbell's "Mosses and Ferns," p. 347.)

The illustrations furnished for this paper represent a simple leaf, Figure 1; a pinnatifid leaf, Figure 2; a pinnate leaf, Figure 3, in which s is the stipe, r the rachis, and p the pinna; the bipinnatifid leaf of Osmunda Claytoniana, Figure 4, in which s is the segment; and the bipinnate leaf of Osmunda regalis, Figure 5, in which p is the pinnule. It will be observed that the pinnae and pinnules in Fig. 3 and Fig. 5 correspond to the simple leaf in Fig. 1. The pinnae in Fig. 4 correspond to the pinnatifid leaf in Fig. 2, and those of Fig. 5 to the pinnate leaf in Fig. 3.

How to Find the Constellations. V.

BY GEORGE I. HOPKINS.

If the observer has made good use of his opportunities during the last months, he has been able to recognize the constellations previously pointed out, at different hours of the night, and note their change of time in crossing the meridian, as well in the rising and setting. Little progress has been made in the recognition and locating of different constellations unless he can do this.

We will still begin our observations at eight o'clock for the sole purpose of enabling the observer to get the groups well as fixed in mind, with the expectation that he will subsequently study their relations at different hours.

Let the observer squarely face the south and lift his eyes to a point a trifle over half way from horizon to the zenith, and he will see a group of four stars, all of the fourth magnitude only three or four degrees apart in the shape of an equilateral triangle with one star in the center. Many persons can recognize it more easily if told that these four stars form the letter Y. This is the distinguishing group of the zodiacal constellation Aquarius and is its most southern part, the greater portion of it extending several degrees to the southward. It contains in all 108 stars, only four of which are as large as the third magnitude. Aquarius means water-bearer and, on pictorial maps, the four stars above-mentioned represent an urn slightly tipped from which the water is flowing. Some mythologists regard this constellation as representing the famous Ganymede, a beautiful youth of Phrygia, who was taken up to Heaven by Jupiter, as he was tending his father's flocks on Mount Ida, and became the cup-bearer of the gods in place of Hebe. The ancient Egyptians supposed the setting of Aquarius caused the Nile to rise by the sinking of his urn in the water; while in the Hebrew zodiac it represents the tribe of Reuben.

Let the observer now fix his attention on the Square of

Pegasus, which is now nearly at the meridian, and notice the star which occupies the upper left hand corner. This, as was stated in the previous number, is Alpharatz, the brightest star in the constellation Andromeda. From this star looking toward the northeast about twelve or thirteen degrees another star is seen nearly as bright. Continue the line another twelve degrees and still another is seen of about the same brightness. These three stars are the most prominent group in the constellation Andromeda, which contains in all sixty-six stars. Just below the group above-mentioned, perhaps twenty degrees, may be seen two other stars, about four degrees apart, of the second and third magnitude respectively, the line joining them being nearly parallel to that connecting the three of Andromeda. These comprise the distinguishing group of the zodiacal constellation Aries which contains the same number of stars as Andromeda, but the most of them are faint. The space between Aquarius and Aries, embracing a quite large assemblage of faint stars, comprises the zodiacal constellation Pisces, meaning the Fishes. Below the constellation Pisces, and reaching at this time nearly to the horizon, is the largest constellation in the heavens, as it extends from Aquarius to the eastward termination of Aries. There are only two stars of prominence in this large aggregation of ninety-seven, these being of the second magnitude. The name of this constellation is Cetus, the Whale. The most prominent group is a cluster of five stars about four or five degrees apart so situated that lines drawn from one to another in succession form a nearly regular pentagon. This is about twenty degrees southeast of Aries and marks the position of the whale's head, the brightest star Menkar being in the very nose. Of course this group, or any other, might as well have been named the Alligator so far as any resemblance to the animal is concerned. But the observer must content himself to be, for the time being, a sort of Polonius to the astronomer's Hamlet, e. g.:

"*Ham.* Do you see yonder group of stars, that's almost in shape of a camel?

Pol. By the mass, and 'tis like a camel, indeed.

Ham. Methinks, it is like a weasel.
Pol. It is backed like a weasel.
Ham. Or, like a whale.
Pol. Very like a whale."

Turning now toward the northeast one can discern a magnificent twinkler of the first magnitude about thirty degrees above the horizon. This is the star Capella, the Goat, and is the principal one in the constellation Auriga, the charioteer, or wagoner. On pictorial maps this constellation is represented by the figure of a man in a reclining posture, with a goat and two kids in his left hand and a bridle in his right. Near Capella, may be seen three stars of lesser magnitude only a few degrees apart forming a small, sharp-pointed isosceles triangle which marks the position of the kids.

> " See next the goatherd with his kids; he shines
> With seventy stars, deducting only four,
> Of which Capella never sets to us;
> And scarce a star with equal radiance beams
> Upon the earth." — *Eudosia.*

Institute Work.

With the return of autumn the set, recognized work of the Manchester Institute of Arts and Sciences has been resumed. For one disposed to the contemplation of such matters, it is interesting also to note how the influence of the Institute work has extended through the summer. The pages of Nature Study have told how some of the members have interested themselves, the birds at Martha's Vineyard, the shed-building ants at Ithaca, the birds observed during a tour in Europe, the ways and doings of graceful garter snakes, the visit of a humming-bird to blossoms held in the hand — these and many other things in nature have been observed and written about. But behind all this is the great body of silent members, who have observed and collected, always with the Institute in mind, but have not as yet written of their observations.

NATURE STUDY.

A MONTHLY BULLETIN OF THE

Manchester Institute of Arts and Sciences.

VOL. I. DECEMBER, 1900. No. 7.

Warblers.

BY ALBERTA A. MACLEOD.

Go, some lovely spring day, and listen to the music of the woods. There is the breeze, that whispers to us of things that lie deeper than words ; the falling of dead twigs ; the woodpeckers tapping ; and the squirrels, that will lead one a long chase sometimes when trying to locate a new bird.

As soon as we are quiet, the birds grow suspicious and begin calling one to another. Warblers are not as curious as most birds, but the faint "zees zees" in the tree-tops will reward you and if you are patient there will be enough glimpses of fairy-like forms to surprise any one who has not tried it. Warblers are at once the delight and the despair of field students. They are found only in America, and of the one hundred species known seventy visit the United States ; the remaining thirty are tropical. As a rule they are arboreal, but in spring and fall visit orchards, ploughed ground, etc. During migration the warblers are usually found in companies composed of a number of species. As the warblers feed exclusively on insects, thousands of miles separate their summer and winter homes

They are the daintiest of the birds, and although they rank low as songsters they delight one with their exquisite coloring.

One would suppose that a group of birds called warblers would be marked by really brilliant musical abilities, but this is not so. Prof. Lynds Jones, of Oberlin College, has made an exhaustive study of the songs of warblers, and finds that in addition to the ordinary conversational song, which is repeated in a careless or contented sort of a way as the bird flits about, which he names the call song, warblers now and then break into a much more complicated and ecstatic flight of music, often when fluttering high in the air, which he calls the passion song, and believes is an outlet of love, pent up energy and enjoyment, which must now and then find enthusiastic expression.

This has, of course, been an extra good year for the study of birds, as those considered quite rare were comparatively numerous. Out of the thirty-one warblers which have been seen in New England, I have seen twenty-six. The Palm warbler is seldom seen in eastern North America, yet this year a third of each flock of Yellow Palm warblers was composed of Palm warblers. One beautiful May morning, taking a basket and trowel and, of course, opera glasses, I went for violets. After filling my basket with lovely bladder ferns, and picking all the violets possible to carry in one hand, I started for a favorite birding place near by. Hearing many mysterious "cheeps," I cautiously crawled under the fence, and saw four white and black warblers scolding a woodpecker. Of all things a black and white warbler to stop eating long enough to even notice any other bird! Madam Woodpecker was inclined to stand her ground, or tree rather, but a more vigorous onslaught settled it and away she flew. While watching these active little birds creep up and down and round and round the trees, one came and lighted on the violets in my hand. How his little eyes shone as he peered into the blossoms, but the desired kind of bug was not there, so away he flew — and I breathed again.

One warm misty day, armed with the usual opera glasses, and choosing the most comfortable place to be found on the stone

wall of a neighboring orchard, I sat down to see wonders of course. Hardly was I seated when a company of blackburnians alighted all about me. The ground and trees were bright with the black and white and yellow of these exquisite beings. Perfectly fearless, they flitted everywhere. Did you ever notice the peculiar duck shape of the blackburnian's body, quite full and round and tapering almost abruptly to a point at the tail? Next came the parula, with its chick-a-dee like habit of clinging to the extreme end of a branch and looking under the little leaves. What tropical beauty could be more gorgeous than the blackburnian warbler, or more delicate and dainty in coloring than the parula or blue-yellow backed warbler. After these came a dozen or more black-throated greens, with "the sweetest song that ever stirred a warbler's throat." That beautiful butterfly, the redstart, visited the tree with his modest little mate. One black poll, and pine warblers in plenty.

The pine warbler is one of the very few warblers I have ever seen during the mid-summer months. Usually warblers are so very high up in tall trees that it is nearly impossible to locate a bird satisfactorily, but I have seen pine warblers near the ground, and once on the ground, in August. Next came Nashville and chestnut sided warblers. The Maryland yellow throat called and scolded from every berry bush. A magnolia warbler alighted long enough for me to notice the placing of the spots on the tail, and the peculiar banded look of the tail as seen from below. Yellow warblers were also there. These, with the oven birds, which were very numerous, made thirteen warblers seen in one apple tree during one forenoon.

During the spring it was my custom to walk down a certain path where I spent many hours making the acquaintance of the yellow throats. I discovered this particular family while they were building their little home. They chose a very small scrub oak, not over fifteen inches high, and under a particularly large leaf built their nest of fine grass and lined it with horsehair. Madam laid five little white eggs, thinly marked with amber spots at the large end. While she was setting he spent con-

siderable time in singing to her. It was surprising to hear the varieties of his pretty little melody. One would think from the yellow-throat's song and movements that he never kept still. But sometimes he would sit perfectly still singing his little song and sunning himself. After the babies came both parents were kept busy, and time seemed only too short before the nest was empty and the little family gone.

While walking through some pines a bird flew out from under my feet. Expecting to find a nest I stooped and looked carefully around. Within six inches of my foot was the nest of an oven bird. There were four eggs in the cozy little oven. What a fuss the madam made! Her mate came flying in haste to join her in trying to distract my attention. I marked the place; then went away. The next day I carefully drew near the nest and sat down. The dear little lady watched me from her open door, but stayed on the nest. The male was singing near. A few days later I happened to be in time to see the newly-hatched birdlings taking a meal. Such homely little bunches of bones. I visited them nearly every day for a week. The mother would come directly to the nest with food, not seeming to mind my presence. After the birds left the nest they all seemed to disappear.

In looking for warblers, as all other birds, location has a good deal to do with one's success. One clump of pines is the home of the pine warblers; another of redstarts. While a deep tall pine woods is sure to be inhabited by black-throated greens, etc. The Wilson's or black cap warbler is in its habits so like the Maryland yellow-throat that although a look will show one the difference in coloring and marking, it might easily be overlooked and called a Maryland yellow-throat. The yellow-breasted chat is the largest and most versatile of the warblers, and is quite rare here. He has so many calls, one is confused on hearing him and imagines there are at least a half dozen birds. Approach ever so quietly, and perhaps you will see him turning somersaults, or stretching his neck, looking in all directions as he hovers over some weed or berry bush. As

soon as he sees you away he goes, and although you may hear him chuckling, he will not come in sight again.

By the last of September the fall migration is under way and we begin to see strangers among our familiar birds. Again we see the dainty parula ,whose "swinging retreat in the hanging moss" is the most aesthetic of bird homes. With him the black-throated blue, and the aristocratic bay-breasted warbler. And some of our dearest local birds are preparing for flight. The little ones are grown up and ready to take their place in the bird world. The family life is merged in the life of the flock and we sadly realize our feathered friends will soon be gone.

Olive Thorne Miller speaks of this strange episode in the life of all our warblers, this mysterious flitting called migration, as "a subject of deep interest and at present very imperfectly understood. We know that the birds go, and where they go, and we can guess why they go ; but why they reverse the usual order of there lives and instead of going to sleep at dark, take that time to start off on a long journey , what route they take ; and who guides them over the hundreds or thousands of miles they travel, and brings them back next spring to the very tree they occupied the previous year ; these things we do not know."

This month we may say with Longfellow :

"I hear the beat of their pinions fleet,
As from the land of snow and sleet,
They seek another lea;
I hear the cry of their voices high
Falling dreamily through the sky,
But their forms I cannot see."

On the night of September 24, between half-past eight and ten o'clock, a large number of warblers passed over. Once in a while flitting forms could be observed, but the greater number were too high to be seen. A few, the weaker ones probably, were flying quite low. That high-pitched, hissing whistle which is the distinctive warbler song type, could be regularly recognized. September 30, a flocked passed, but not so large as the one just mentioned. October 1, there was a notable increase

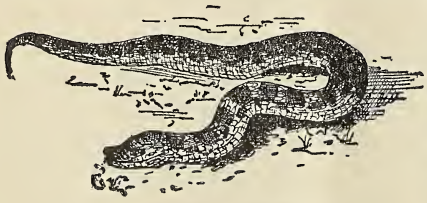
of migrants. Myrtle warblers, black-throated greens with young, the golden-winged and prairie warblers. And a warbler that I recognized through Chapman as the worm-eating warbler. This bird has been reported from Maine, but not from New Hampshire, so far as I know. By a small brook was a large flock of water thrushes walking about. This warbler is almost always walking on the ground, or wading the shallows of small streams. When walking about he has a habit of jerking his tail upward with every few steps, and when alighted on a fence or low limb of a tree is constantly teetering his body.

In the study of the life and affairs of birds, nature's loveliest creatures, one realizes with the late Frank Bolles that "no lifetime is long enough to learn all about even one bird."

A Much Maligned Reptile.

BY WILLIAM H. HUSE.

Heterodon platirhinos is the book name of a little animal that is variously known as deaf, hissing, puffing or spreading adder; blowing or sand viper. These names are either indicative of its appearance or suggestive of its habit of flattening itself when surprised and hissing by blowing forcibly through the small opening in the front of the jaws through which the tongue is extended for purposes of investigation. As the breath is drawn in the noise is almost as great as when it is expelled. The spreading of the body makes it nearly twice as wide as it is naturally and renders it truly formidable in appearance while the hissing is quite startling. It has all the appearance of a dangerous reptile and it is no wonder that the popular mind has not only called it veno-



PUFFING ADDER.

mous but filled its breath with noxious qualities. The stories heard in boyhood concerning its poisonous powers made me ready to give it a wide berth whenever we should chance to meet, although my curiosity longed to be satisfied.

Lately a specimen was found near by and given to me. It is about two feet long, of a dark brown color, nearly black, with irregular darker blotches along the back which are hardly noticeable, except near the tail. Most specimens are lighter in color, when the blotches show more plainly. The under side is gray with numerous black dots along the sides. The nose is a peculiar feature. The rostral plate is pointed and turns up slightly, somewhat like a hog's snout. The same plate is keeled above, making it look a little like a kernel of buckwheat.

The snake is not only harmless but is also perfectly gentle. Though it is ferocious in appearance its ferocity is clearly a case of mimicry. So completely does it imitate some of the poisonous serpents that it is not to be wondered at that those who have never tested its gentleness should give it an evil reputation. It cannot be made to bite and has no fangs to use if it should try. The specimen I have has manifested no disposition as yet to eat, but has attempted to burrow in the sand in the cage, probably with intention to hibernate.

Though few in numbers so far north, it is probable that they do at least as much good as harm and help keep the balance of nature until the lords of creation meet them and kill them simply because they are snakes.

There is another ophidian that is also much slandered and abused. It is the milk snake or checkered adder which is perfectly harmless, all reports to the contrary notwithstanding, although he will fight if interfered with. A short time ago a neighbor found one in front of his barn and of course killed it. Then he put it in a paper bag and sent it to me. It had just dined and an examination revealed two young mice in the stomach. It also revealed the cruel heedlessness of us superior beings. The pretty, shy, harmless milk snakes come to our sheds and barns to catch mice and we promptly kill them.

A Lesson of the Autumn Days.

BY SUSY C. FOGG.

A member of our Institute has said, "I always try to see some good and beauty in things I see every day." Is this motto not worthy of thought, and possible for every one living in a city of the size of ours; and where may we seek for a greater or more constant charm than in the coloring of all things about us, for we live in a world of color, marvellously beautiful!

The birds will not always sing in our city streets, the flowers cannot grow there; but we always have, and cannot get away from, some remnant of glory in tree or sky, or even the sunshine against the shadow; and if we go outside the town, our eyes analyze the landscape till they become satiated with color, and our whole being is aglow with its mystery and delight, and we feel with the artist, who said, "If I should paint my pictures in half as brilliant tones as I really see my subjects, no one would think them natural." In the autumn we need make no search, but are impressed with the beauty of color on every side. It was a pretty fancy of the good pastor who, some time since, told his congregation of how the torch was first lighted among the soft maples in the lowlands, and the flame spread until it climbed the hillsides, the maples still being in the lead, and then the harder woods, the beeches and the royal oaks, put on the scarlet and the purple, till all the country side was ablaze with color. "This is not the sad season, but the miracle play of all the year."

At sunset, on the day of November third, our western sky was a fine mesh of clouds, which glowed for a long time like live coals, and the beauty of the delicate tracery of the bare, brown limbs of our city trees against the sky must be seen, not described. This was followed by a similar display on the succeeding night, the intense, glowing red being replaced by a golden glory.

But the color picture which lingers is not always so striking

We stand, on a dull day in late October, beneath an apple tree, from which the brown leaves are mostly fallen, but we are surprised to see how the rain has left them bright and shining, and with their little red and white stems lying criss-cross make such a pretty carpet!

Perhaps it is in a Pennsylvania cornfield we remember. The corn has been harvested, but hundreds of golden pumpkins have been left to mellow in the September sun, real storehouses of warmth and sunshine; or perhaps it is an apple orchard still green, in the neighboring town of Hooksett, and under the trees have been collected the piles of red and yellow apples, making a picture which we do not soon forget.

At this season the lakes reflect the deep, clear blue of the sky, and grow bluer because of the white sand and pebbles and dark green pines on shore.

If we go into the penetrating silence of the woods, we see the arches overhead shot through and through with rods of slanting, golden light, and even the rough bark of the tree trunks has caught the purple hue of the Indian summer haze, so subtle that it almost vanishes at second sight. The rocks are gray-green with the daintiest of mosses, and

> "lichens mock
> The marks on a moth, and small ferns fit
> Their teeth to the polished block."

In the coming days the colors will not be so apparent as in the season just passed, but there will always be some winter bird, beautiful even in sober dress, or blossoming window plant, and the old farmer understood, when he said, "There is not a color made but what God has put it on my birds and flowers." The russet oaks will shine in the morning light, and there will be a rose-colored rift in the wall of cloud at sunset which the coldest snow and the grayest ice are bound to reflect, when, a few minutes before, all looked so unresponsive.

Let us feel sure, then, that every day will hold some store of beauty for us, every object will glow with that color which is possible to it, and that we shall see more and more of that radiance, like unto April sunshine, which fills the lives of Zo and Mildred, who are two dear little children, living in the Golden A e.

Ferns and Fern Allies. III.

BY FREDERICK W. BATCHELDER.

As was stated in a former article, our local ferns, so far as at present known, belong to the three families, Ophioglossaceae, Osmundaceae and Polypodiaceae. The order in which the names are given indicates also the order of natural development, the first family comprising the oldest and least specialized forms, the third the most recent and specialized forms, the second certain forms intermediate between the other two. The second family is represented in this part of the world only by the genus Osmunda. In it the process of reproduction by means of spores is initiated in a way slightly differing from that which prevails in the third family, and the character of the tissues is also somewhat different, resembling that of the first family. In technical language, then, the osmundas may be said to constitute a link between the "eu-sporangiate" and the "lepto-sporangiate" ferns.

In plain English this means that they are intermediate between the ancient, less specialized and the modern, more specialized types. The recent discovery of this connecting link has put the Ophioglossaceae back with the true ferns, from which they had been for some time separated. Dropping, for the most part, technical terms, I will now proceed to treat of this most interesting family.

There are but three genera known: Ophioglossum, Helminthostachys and Botrychium. Of the first and third there are about ten species each, and both genera are represented in our flora. The second is a native of southern Asia and but one species is known at present In New England Ophioglossum is represented by the species O. vulgatum, the "adder tongue fern"; Botrychium by six or more species, all going by the name of "grape fern," from the resemblance of the small clusters of sporangia to minute bunches of grapes. In England the grape ferns are called "moon worts", in allusion to the "lunate" (moon shaped) segments of the leaves in the species common there. As but one

of our species has this sort of leaf, and is, besides, extremely rare, the name "grape-fern" is preferable here.

It may be a matter of surprise to many to be told that beautiful specimens of the grape-fern may be found in late fall and early winter, in fact until low plants are covered with snow. The species "ternatum," "ternate grape-fern," begi ns to fruit in September and is at its best in October and November. It may be found in almost any damp wood or field, especially in the narrow strips of land between wet and dry places, or wherever there are accumulations of leaf mold. The stalk of the plant is partly under ground so that all that can be seen is a horizontal leaf and, when the plant has succeeded in producing fruit, a slender spike, more or less branched, bearing the spore cases. This season the proportion of fruiting to non fruiting plants has been in this vicinity about one to six. If the plant is carefully dug up it will be found that it has a large root of thick, fleshy fibres. (See Fig. 1.) From the root rises a somewhat stout stem, which is in reality the leaf stalk. In fruiting plants this stalk divides quite near the base into two portions or "segments" called the sterile and fertile segments. The fertile segment is erect and forms a branched spike, but the sterile segment is horizontal and very variously cut in different plants, though it always has the three principal branches which the name "ternate" implies. (See Fig. 2.) This various cutting of the leaf has given botanists a great deal of trouble.

FIG. 1.

Several varieties have been named and the end is not in sight. At least one form has been elevated to the rank of a species by some systematists. The fact is that the intermediate forms are so numerous and so common that it would seem preferable to consider the whole series as belonging to a single polymorphous species The forms found in this vicinity are chiefly those which have been named varieties "intermedium," "obliquum," and "dissectum". Plants resembling the described varieties "australe" and "lunarioides" are rare. In all these varieties except "australe" the leaves vary greatly in size, ranging from two to eight inches across. In "dissectum" the sterile segment is cut into minute lace-like divisions so that when mounted on white paper the effect is as delicate and beautiful as tha of an alga similarly prepared. In "obliquum" the lobes are more or less pointed and in "intermedium" more or less rounded. Occasional forms have the three primary divisions nearly entire.

Not only is the sense of beauty gratified by the exquisite forms of the leaves; the colors are also strikingly beautiful. Maturing late in the season the plants apparently try to compete with the deciduous trees and shrubs in variety and delicacy of tint, some being vivid green, others darker to very dark green, some of a rich maroon, others almost livid in hue. It is not uncommon to find the sterile leaf of the year before still attached to the stalk. The bud for the next season being enclosed in the base of the stalk is not visible from without, but a careful section will reveal it.

There is not a more delightful pastime in those sunny days which a kind Providence sends just before winter sets in than a hunt for these pretty plants. The trees have shed their leaves, so that the sunshine pours freely down upon the brown and sodden carpet of the woods. The shrubs, too, are bare and no longer conceal the objects of our search. Sometimes we may look a long time before finding any. Sometimes we may come across them in abundance. The result depends partly upon the season, partly upon our choice of ground and partly upon our powers of observation, to say nothing of that other important

factor which may be called "botanist's luck!" When we have found one we should always look closely for more, the presence of that one indicating a favorable habitat.

FIG. 2.

For my part, I always feel, when I spy one of these queer little plants peeping out of the dried leaves, like calling out, "Hello, old fellow!" However young he may be individually he is the representative, by direct descent, of an old, aristocratic and exclusive family. He has managed by dint of a long series of natural selections reinforced by a healthy constitution to hold his own against the odds of specialization and elimination and over-population. He still evolves his spores in the same old way; he still persists in forming his buds two, three, possibly four years in advance — these may all be found by careful searching — and he utterly refuses to hurry at any stage of his growth. I admire him for his independence, and heartily wish I could predict for him a better fate than that which I know is in store for him. Alas! like the Adams family, he is "a back number." Pretty soon — i. e. in a million years or so — the common, vulgar, new ferns which evolve their spores in a more economical way and develop the tissues with greater strength and have acquired the power of growing faster will crowd upon this poor fellow's descendants and leave them no foothold on this great globe of ours!

In the next article I will continue the consideration of this peculiar family, describing the other species of Botrychium and their haunts, and also Ophioglossum (adder-tongue fern), the grandfather of them all and, in truth, a "name to conjure with."

Figure 1 represents a whole plant of the "ternate grape-fern;" Figure 2, a sterile leaf of the same seen from above; both

drawn from living plants. The variety is "obliquum" and the botanical name is "Botrychium ternatum obliquum," meaning literally that grape fern which has ternate leaves in which the sides of the lobes are oblique (not parallel). The application of the varietal name "obliquum" is not always obvious.

How to Find the Constellations. VI.

BY GEORGE I. HOPKINS.

In answer to some inquiries it must be stated that these directions for locating the constellations are for latitude 43° north. If the observer's latitude does not differ from this more than two or three degrees then no allowanec need be made. If it be more than three degrees different, then corresponding differences will need be made when distances from horizon or zenith have been given. For instance, if the altitude of a certain group of stars was given as 30° above the southern horizon, and the latitude of the observer is only 35° north then the altitude of that group above his southern horizon will be 8° more, i. e. 38°, while if he be in latitude 50° north then the altitude of that group will be 7° less, or 23°. Similar changes must be made respecting the zenith distance.

The first group to which the observer's attention is directed this month is nearly due west, at an altitude of about 45° and is in the shape of a large Latin cross situated directlv in the milky way, its longest piece being perpendicular to the horizon. This is the distinguishing group of the Constellation Cygnus, the Swan. The uppermost star in this group is called D neb and is of the second magnitude. According to the British Catalogue this consellation contains 81 stars, whereas 107 is claimed by the author of the following lines.

"Thee, silver Swan, who, silent can o'erpass?
A hundred with seven radiant stars compose
Thy graceful form; amid the lucid stream
Of the fair Milky-Way distinguished; one
Adorns the second order, where she cuts
The waves that follow in her inmost track;
This never hides its fire throughout the night,
And of the rest, the more conspicuous mark
Her snowy pinions and refulgent neck." — *Eudosia.*

Turning now to the east the observer can see a small cluster of stars at an altitude of about 35°. These are known by various names, Pleiades, Seven Stars, the Seven Sisters, and also the little Dipper. The first given is the true name and is so called from a Greek word meaning "to sail," because of their service to the mariner. The number of stars in this cluster visible to the naked eye at one count is six; if the gaze be continued, however, two or three more can usually be seen to flash out at intervals so that a keen eve can usually in the course of a minute or so make out eight or ten; while the telescope reveals more than two hundred. The Pleiades have also been termed Vergiliae, or the "Virgins of Spring," because the sun enters this cluster in the "season of blossoms," or about the 18th of May. It is claimed that reference was had to this fact in the Scriptural demand upon Job: "Canst thou bind the sweet influences of the Pleiades or loose the bands of Orion?"

Directly below the Pleiades about 10° is another group of five stars in the form of the letter V lying on its side with the opening toward the north. It has also been likened to the old fashioned harrow. This group is called the Hyades and was supposed by the ancients to influence the fall of rain, and so was called by Virgil the "rainy Hyades."

The brightest star in this group is of a reddish tint and is of the first magnitude. Its name is Aldebaran, another of Ben Hur's horses.

Both these groups belong to the constellation Taurus, the Bull, one of the zodiacal groups, the ecliptic passing about midway between the Pleiades and Hyades. This entire constellation contains 141 stars visible to the unaided eye.

"So did he feel, who pull'd the boughs aside,
That we might look into a forest wide,
To catch a glimpse of Fauns and Dryades
Coming with softest rustle through the trees;
And garlands woven of flowers wild and sweet,
Upheld on ivory wrists, or sporting feet:
Telling us how fair trembling Syrinx fled
Arcadian Pan, with such a fearful dread.
Poor Nymph — poor Pan — how did he weep to find
Nought but a lovely sighing of the wind
Along the reedy stream! a half-heard strain,
Full of sweet desolation — balmy pain." — *John Keats.*

A Twilight Moth.

BY MADISON CAWEIN IN LIPPINCOTT'S.

Dusk is thy dawn; when Eve puts on her state
Of gold and purple in the marbled West,
Thou comest forth like some embodied trait,
Of dim conceit, a lily-bud confessed;
Or, of a rose, the visible wish that, white,
Goes messengering softly through the night,
Whom each expectant flower makes it's guest.

All day the primroses have thought of thee,
Their golden heads close haremed from the heat;
All day the mystic moon-flowers' silkenly
Veiled snowy faces — that no bee might greet
Or butterfly that, weighed with pollen, passed,
Keeping Sultana charms for thee, at last,
Their lord, who comes to salute each sweet.

Cool hearted flowers that avoid the day's
Too fervid kisses; each pale bud that drinks
The tipsy dew and to the starlight plays
Nocturnes of fragrance, thy wing'd shadow links
In bonds of secret brotherhood and faith;
O bearer of their order's shibboleth,
Like some strange symbol fluttering o'er these pinks.

What dost thou whisper in the balsam's ear
That sets it blushing ? or the holyhock's
Of syllabled silence, that mo man may hear,
As dreamly upon its stem it rocks ?
What spell dost bear from listening plant to plant
Like some white witch, some ghostly ministrant,
Some specter of some perished flower of phlox.

O voyager of that universe which lies
Between the four walls of this garden fair
Whose constellations are the fireflies
That wheel their instant courses everywhere —
'Mid fairy firmaments, wherein one sees
Mimic Bootes and the Pleiades,
Thou steerest like some elf ship-of-the-air.

Gnome-wrought of moonbeam-fluff and gossamer
Silent as scent, perhaps thou charioteest
Mab or King Oberon; or, haply, her
His queen, Titania, on some midnight quest,
O for the herb, the magic euphrasy,
That should unmask thee to mine eyes —ah me ! —
And all that world at which my soul has guessed

NATURE STUDY.

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The Canada Goose.

BY THEODORA RICHARDSON.

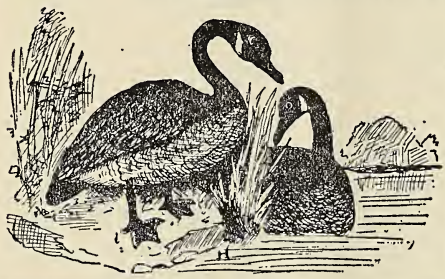
It was a gray day in later October when we discovered, coming toward us in the northern sky, a tiny line which proved to be twelve Canada geese, flying, as they sometimes do, in single line rather than in the two lines of the wedge. They passed like an aerial train, swiftly, with direct southern course, passing steadily over the stark, silent woods, never heeding the calm, silvery lake, disappearing from view behind the distant blue hill. They were flying quite low, their usual flight being about a mile in height.

All had witnessed a rare picture in migration. From whence had they come, and whither were they going? Most birds are seldom seen in this migratory flight, though we often hear their call notes as the birds pass over.

One spring evening a fog arose, enshrouding everything in its dense misty veil; at about eight o'clock the "honk, honk," of wild geese was heard in various parts of our city; evidently the geese had become bewilderd by the electric lights, had deviated

from their course and were circling about the city. On one occasion these long-necked graceful birds were watched from the car window of an express of forty miles an hour; they kept along for several miles in a parallel line with the train, with no apparent effort, in strong, even flight, until they were cut off from view by a bit of woods.

Mr. Isaac Huse, of our city, for several years, had a flock of these Canada geese. The original were wounded in the wing, and brought down. As their flight was thus prevented, they settled down contentedly on the shores of an artificial pond near Mr. Huse's home. Here they raised their young, brooding them on the small islands in the pond, where they were undisturbed. The young birds had their quills cut each year, and were thus prevented from flying until their new feathers grew out the following summer, when they enjoyed a few weeks of freedom. During these weeks, as their wings grew stronger,



they took longer flights, sometimes being seen ten miles away, on our Massabesic Lake, or on the Merrimack River. Then the first flock from the north would be claimed to have been seen by some gunner, who would bag one or two of the geese. Their freedom was then cut short by the wing clipping, and being well fed, like other domestic fowls, and given only enough water for drinking, they passed the winter contentedly in a shed, until the mysterious spring awakening filled them with feverish alertness for liberty, when they seemed hungering to find a bit of bare ground, and green grass, or other vegetable growth which they feed upon.

When the spring fairly appeared they walked long distances, even with such short legs. They are better walkers than ducks, as their legs are placed farther forward. Some of these geese

interbred with the domestic gray goose, producing a hybrid a little larger and duller colored than its wild parent.

In Montana these birds are stated to build in the heavy timber along the large streams, and to transport their young in their bills to the water, in this corresponding to the wood duck. Dr. Coues says; "I found the circumstance to be a matter of common information among the residents who expressed surprise that it was not generally known."

There are four different forms of gray goose, the Canada goose, Brauta canadensis; Hutchinson's goose, Brauta canadensis hutchinsii; white cheeked goose, Brauta canadensis occidentalis; cackling goose, Brauta canadensis minima. The two last named are exclusi ely Western, and the Hutchinson's goose is nearly so, while the Canada goose is the best known and most common. Its head, neck, rump, and tail are black; a triangular white patch on each cheek meets under the throat; the upper and under tail coverts and lower belly are white; the upper breast is grayish fading to white on the belly, while wings, sides and back or grayish brown with lighter colored tips.

In an article in "Field and Stream" January, 1900, a sportsman states that the full grown Canada goose often attains a weight of twelve to twenty pounds. This writer had on his record one which weighed eighteen and a half pounds. The bird's length is from thirty five to forty inches, its wing eighteen inches. With this extreme weight to propel through the air, how much more remarkable, then, their sustained flight! And what strength must be in their wings! Presumably Bryant had the wild goose in mind when he wrote:

Whither, 'midst the falling dew,
While glow the heavens with the last steps of day,
Far, through their rosy depths, dost thou pursue
Thy solitary way!

Vainly the fowler's eye
Might mark thy distant flight to do thee wrong,
As, darkly painted on the crimson sky,
Thy figure floats along.

* * * * * * *

There is a Power whose care
Teaches thy way along that pathless coast,—

The desert and illimitable air,—
Lone wandering, but not lost.

All day thy wings have fanned,
At that far height, the cold, thin atmosphere,
Yet stoop not, weary, to the welcome land,
Though the dark night is near.

* * * * * * *

Thou'rt gone, the abyss of heaven
Hath swallowed up thy form; yet, on my heart
Deeply hath sunk the lesson thou hast given,
And shall not soon depart.

He who, from zone to zone,
Guides through the boundless sky thy certain flight,
In the long way that I must tread alone
Will lead my steps aright.

Concerning Some Kindly Criticisms.

BY FREDERICK W. BATCHELDER.

"Nature Study," being the official organ of the Manchester Institute, is the proper medium through which notices of the first volume of Proceedings should be acknowledged and criticisms answered. It was inevitable that some errors should be made in the compilation of Preliminary Lists, the territory under investigation being new and the workers comparatively inexperienced. To those who honestly seek the truth a criticism by experts, however severe, should be a source of pleasure rather than of mortification. Accordingly it is with sincere pleasure that the compilers of the Preliminary List of Birds have received a very candid criticism of their work, accompanied with some suggestive inquiries, from a member of the A. O. U., Mr. Walter Deane, of Cambridge, Mass., and, through him, from Mr. William Brewster.

These gentlemen, after warmly commending the list as a whole, proceed to question the notes regarding the breeding range of some of the species and to suggest that several other species ought to be added either as migrant or resident. A consideration of these criticisms will be extremely useful to local observers and I will accordingly note them for their bene-

fit, following the order in which the species named occur in the A. O. U. list and also in ours.

No. 357. *Falco columbarius.* Pigeon Hawk.

Common summer residents.

" It is literally impossible."

In this case, and this only, we shall back down at once and admit ourselves to have been the victims of misplaced confidence. A pair of " pigeon hawks " reported as having been shot in the town of Candia in the breeding season, turned out on investigation of the mounted specimens to be *Falco sparverius*, sparrow-hawks. Even had this pair been genuine it would have been an error in judgment to note the species as a " common summer resident. " It is, of course, a transient visitant during migration.

No. 364. *Pandion haliaetus carolinensis.* Osprey, Fish Hawk.

" Are you sure that it breeds? "

The frequency of these birds about Lake Winnipiseogee and along the upper Merrimack river in summer tends to justify this conclusion. Positive evidence may not as yet be sufficient, and it should be secured as soon as possible.

No. 466 a. *Epidornax trailii alnorum.* Alder Flycatcher.

" Must breed with you. "

This is the eastern range of Traill's Flycatcher. Who will be the first to find and verify it here?

No. 527 a. *Acanthis hornemannii.* Hoary Redpoll.

No. 528 b. *Acanthis linaria rostrata.* Greater Redpoll.

"Look out for these. "

We have no doubt both these allies of the common red poll (red poll linnet) were with us last winter. As none were taken, however, conclusive evidence is lacking.

No. 583. *Melospiza lincolni.* Lincoln's Sparrow.

" Surely passes through. "

Will every one please look for him?

No. 631. *Vireo novaboracensis.* White-eyed Vireo.

"Is evidence conclusive that the bird breeds with you?"

Here again only one thing is lacking, the examination of the "bird in hand."

No. 662. *Dendroica blackburnia.* Blackburnian warbler.

"Must breed with you."

It has been so reported, but in this case the evidence was not convincing.

No. 672. *Dendroica palmarum.* Palm Warbler.

"Look carefully for."

This species, the typical palm warbler, appeared to us for the first time and in considerable numbers last May during the remarkable incursion of warblers from the first to the twelfth of that month. It was perfectly distinguished from its variety, the Yellow Palm Warbler, which is always abundant in migration.

No. 755. *Hylocichla mustelina.* Wood Thrush.

"This is common about Willoughby Lake, Vermont."

Glad to know it, for then it should certainly be about Lake Winnipiseogee, as reported. Will some one verify this for us?

If local observers will preserve these notes and make use of them the coming season several important additions may by this means be made to our list.

Section C, while for the present continuing the study of the ferns, will modify the program with half-hour pastimes in structural botany. Several gentlemen have tendered the loan of microscopes, and some very good sections hsve already been stained and mounted for use in the class room.

The interest awakened by the study of vertebrate zoology has resulted in a considerable addition of skulls and vertebrae to the Institute's museum.

Three months more and then come the spring days; but as a matter of fact the naturalist finds that all the seasons belong to him.

Ferns and Fern Allies. IV.

BY FREDERICK W. BATCHELDER.

There are ten or more species of grape fern (Botrychium) at present known. New England possesses a remarkably large representation of the genus, six or more species being found within her boundaries. These six, 1, B. simplex, 2, B. lunaria, 3, B. matricariaefolium, 4, B. ternatum, 5, B. lanceolatum, and 6 B. virginianum, are recognized by all botanists as good species. Specific rank is claimed by some authorities for that form of the ternate grape.fern which has finely dissected leaves, with the name " B. dissectum," and as such it is described and figured in Britton and Brown's Illustrated Flora, Vol. III, Appendix, p. 494. But if " dissectum " is a good species, why not " intermedium " and others which are as well distinguished from the rest and which are in fact less closely connected through intermediate forms than are " dissectum " and " obliquum " ? If the species is to be subdividedt at all half a dozen new species may be created as well as one. Perhaps this may be the final outcome of long continued investigations and ecological studies of this polymorphous species.

The second of the species named above, B lunaria, is the only one which can with propriety be called a moonwort, the lobes of the sterile portion being " lunate". This is also that one of the six which is least likely to be found in our special area. The first, B. simplex, is a possibility. The othor four may be called abundant.

About five years ago a seventh species was discovered in our own state by Mr. Alvah A. Eaton, of Seabrook, now a pteridologist of national reputation It was published as " B. tenebrosum " and is generally acknowledged as a good species. It received its name from the habit of thriving only in shade.

The ternate grape fern described in the last article is the only one which has persistent leaves lasting through the winter, and which fruits late in the season, being at its best in October and

November. The ease with which it may be found is in striking contrast with the difficulty which besets the search for Nos. 3 and 5. These mature in the season of rankest growth of tree and shrub, aud being inconspicuous plants are likely to be over looked. In height they vary from one or two to ten or twelve inchs and their eolor is a light shade of green, which renders it difficult to distinguish from the surrounding verdure. The fertile portion of the leaf is erect, as in all the genus. The sterile portion in number three is borne near the suumit of the stalk and has a short petiole; in number five, the sterile portion is sessile at the summit of the stalk, and, as the specific name "lanceolatum" inplies, the ulti mate segments are inclined to be lanceolate. The name of number three, "matricariaefolium" from a supposed resemblance of the leaf to that of a kind of chamomile (Matricaria).

For the ternate grape-fern we chose a day in the middle or late autumn, because then not only was the plant at its best but the conditions were most favorable to its discovery. When we would find the two species under consideration we would best select some fine day in June, for then the later plants of number three and the earlier ones of number five would be likely to be found in fruit. We should take our way to some rich moist wood where leaf mould would tend to accumulate in the little depressions. A very good sign of a suitable habitat for these little ferns is the poison ivy, (Rhus radicans) and I always begin to look for them when I find myself surrounded by the dark triple leaves. Fortunately the ivy does not seriously affect me and I paw amongst the leaves without fear of consequences. In this vicinity number three is by far the most abundant, sometimes hundreds of plants growing in a single station. It is not impossible that many of the plants hitherto called "matricariaefolium" may have been of the newly named species "tenebrosum," a point which the researches of the coming season ought to decide. Number five is usually found associated with number three but not always.

There remains one more species to be considered, B. virginia-

num, for some unaccountable reason called rattlesnake-fern. This is the largest by far in the genus and where it grows at all is apt to be very abundant. It favors sloping ground in rich woods, especially in the neighborhood of streams. The plants vary extraordinarily in size, sometimes maturing and fruiting when barely six inches high, and on the other hand sometimes attaining a height of two or three feet. I once found one in Hudson, N. H., which measured three feet two inches in height and which had a stalk not less than an inch in diameter two inches from the ground. The leaf in this species is large, thin and beautifully cut into numerous more or less toothed divisions, and it spreads out horizontally from near the middle of the stem.

In the next number I propose to consider the relations of these different species to each other and to the genus Ophioglossum, which is the type of the family.

Digger Wasp and Grasshopper.

BY THEODORA RICHARDSON.

I observed an interesting episode in wasp life on August 18. We saw one of the all metallic blue digger wasps dig a hole in the hard earth by the roadside. When the excavation was completed, she dragged a large brown grasshopper, our largest cinnamon-colored one, about two and one-half inches long, to the hole and, seeing us, was startled and flew away. We withdrew, but returning later, dug open the cell and found this great orthopteron in a sort of comatose state, such as William Hamilton Gibson describes in his "Sharp Eyes," in connection with the mud dauber's nest filled with paralyzed spiders. The creature would give spasmodic movements of the hind legs when touched, and on one side the egg of the wasp, I suppose, was deposited near the joining of the hind leg and the body of the grasshopper. It was small and white, and seemed to be but a single one. I kept the insect, to see how long it would live, and it lived two days.

A Kindly Suggestion.

To the Editor of Nature Study:

May I ask for a little space in the columns of Nature Study and permission to express humbly my feelings on a point which the perusal of its pages has raised in my mind.

On p. 102 in the December number, the presence of a worm-eating warbler in New Hampshire is mentioned, though the bird was apparently not shot. May I suggest that a record of this kind will prove nothing but a source of trouble to later bird students in New Hampshire? It can never be accepted as authoritative, no matter how careful the observer may be, unless the full details are published and the observer has an almost national reputation among his fellow ornithologists.

I do not mean to impugn in any way the accuracy of your contributor's observation, but merely to call attention to the difficulty later ornithologists will have in handling this record when a new list of New Hampshire is printed; some action will have to be taken on this record, and I fear that in the absence of the confirmatory details and other information, it will have to be thrown out.

The practice of several field ornithologists whom I know is never to publish any record of this sort, though their names would carry much weight, simply to avoid the trouble that the record is bound to make. They have the satisfaction of having seen the rare bird, but they wisely deny themselves the indulgence of proclaiming their good fortune.

I hope that I need not say that it is because my interest in the Manchester Institute is very keen, and my wishes for the success of "Nature Study" very hearty, that I venture to address you on this point. If your journal wins at its very beginning a reputation for scrupulous care about such matters, it will soon prove a help not only to the naturalists of Manchester, but will also be consulted with interest by fellow naturalists throughout New England, and become, I trust, a model for any other city,

which is fortunate enough to possess as enthusiastic and capable naturalists, as evidently live in Manchester.

Yours very truly,

Belmont, Mass., Dec. 9, 1900. RALPH HOFFMAN.

Abnormal Incisors.

BY WILLIAM H. HUSE.

There is no limit to the growth of the incisors of rodents. They are kept from becoming too long by the constant wearing away of the ends in the process of gnawing. By a curious arrangement of the enamel which is much thicker in front than on the backside the back wears away the faster and leaves the ends chisel-shaped. Sometimes an accident to one tooth or eating soft food for a while causes one or more of the teeth to attain an abnormal length that will in time prevent the animal from eating and cause his death.

An example of such a growth of the teeth was recently exhibted in the Institute rooms in the shape of a mounted woodchuck

head from the zoological collection of Mr. S. F. Heath of this city. The woodchuck was found several years ago in a sewer and shot. He had entered the pipe in some way and found himself a prisoner with no food except the soft, water soaked, edible matter that floated down to the river. As a result the lower incisors grew to a length of two inches, projecting beyond the nose; while the left upper tooth passed outside the mouth and formed a hook beside the cheek. The other upper incisor curved in and upward till it entered the roof of the mouth. During his latter days it must have been impossible for the woodchuck to close his jaws and he must of necessity have subsisted upon what he could drink from the sewage.

Tributaries and Water Power.

The effect of erosion upon the manufacturing possibilities of a region was recently set forth in a paper by Prof. John A. Dresser, On the Physical Geography of a Northen Section of the Appalachian Mountain System," first published in the Bulletin of the American Bureau of Geography.

The Notre Dame Mountains comprise that portion of the Appalachian system which lies within the Provinc of Quebec, and are the unbroken extension northward of the Green Mountains of Vermont and the White Mountains of New Hampshire. After describing the chief geological features, Professor Dresser goes on to trace the geological development of water power in that region as follows :

" Although the region of the Notre Dame mountains has been one of great erosion, as well as structural complexity, and consequently its true geological features are often very difficult to discern, yet the dependence of important ropographical forms upon them is very readily apparent. The trend of the long hills of harder or more enduring strata is prevailingly parallel to the main axes of folding, and consequently the intervening valleys, whether caused by folding or erosion, have the same northeast and southwest direction. But these are only secondary valleys of drainage; for the principal rivers, such as the St. Francis and Chaudière, have their courses transverse to the mountain ranges, still in the main retaining their pre-Appalachian valleys, and run in a northwesterly direction to the St. Lawrence river of which they are themselves tributaries. These antecedent rivers have been strengthened by the inclosing of weaker ones, which, being unable to cross the barriers raised by the Appalachians, have turned their courses into the longitudinal valleys and so become their tributaries. Thus these river valleys which are again approaching the stage of maturity are often much older than the valleys of their tributaries. It accordingly happens that several of the tributaries still empty into the larger rivers with a considerable fall, thus giving rise to the best water lower of the district. The city of Sherbrooke. an important manufacturing center, owes its existence, in a large measure at least, to the magnificent water power afforded by the Magog in its precipitous descent to join the St. Francis at that poiut. The Wattopekah is an east-

ern tributary of the St. Francis, which also joins it by a succession of small falls, large enough, however, to furnish excellent water power for the pulp and paper industries which gave rise to the flourishing town of Windsor Mills. The numerous smaller mills throughout the country, which mark the earliest points of settlement, are most frequently situated on east and west running streams."

How to Find the Constellations. VII.

BY GEORGE I. HOPKINS.

A survey of the northern sky on the first evening of the twentieth century at eight o'clock discloses Ursa Minor immediately beneath the pole star in such a position that its brightest star Alpha is exactly on the meridian. Lyra, as shown by the brilliant twinkler Vega, is nearly to its setting in the northwest, while near by appears the large cross, erect, in Cygnus. Over in the northeast Ursa Major is seen while Auriga, located by its brightest star Capella, is well up toward the zenith. Between Ursa Major and Auriga is a region of faint stars a few of which next to the Dipper belong to Ursa Major, while the rest constisute the constellation Lynx. As there are no stars brighter than the third magnitude in this constellation, and only three of these, it presents no prominent group by which it may be recognised, consequently the only guide to its location is its position with reference to other groups. It contains in all forty-four stars.

If the observer will now direct his gaze to the zenith he will see two stars about ten degrees apart, of about the second magnitude, both very near the meridian. The lower one is in about the centre of a line of stars forming a curve which lies in the Milky Way and extends in the same general direction. This is the distinguishing group of the constellation Perseus. The star nearest the zenith, within about three degrees, is Beta Persei, and is named Algol. It is one of the most noted of the variable stars, being of the second magnitude most of the time. Then at regular intervals its brightness diminishes in about four hours until it is as faint as the fourth magnitude, at which it remains

about fifteen or twenty minutes when, in another four hours, it again attains its maximum brightness, going through these changes in a little less than three days. Algol and the few lesser stars clustering near it form the Caput Medusae, the Head of Medusa. Medusa was one of the three frightful Gorgons, represented with serpents writhing and twisting around their heads intead of hair, having yellow wings and brazen hands, their bodies covered with impnetrable scales, and having the power of turning into stone all those on whom they fixed their eyes. Perseus was the son of Jupiter and Danae. He was no sooner born than he was cast into the sea with his mother; but being driven on the coast of one of the islands of the Cyclades, they were rescued by a fisherman and carried to Polydectes, the king of the place, who treated them with great humanity, and intrusted them to the care of the priests of the temple of Minerva. His evident genius and manly courage soon made him a favorite with the gods. At the feast of Polydectes all the nobles were expected to pre. sent the king with a superb and beautiful horse. But Perseus, who was deeply grateful to his benefactor, wishing not to be thought less munificent than the rest, engaged to bring the head of Medusa, the only one of the three that was mortal. For this perilous enterprise Pluto lent him his helmet, which rendered him invisible. Minerva furnished him with her buckler, while Mercury gave him wings for his feet and a danger made of diamonds. Thus equipped he mounted into the air, conducted by Minerva, and came upon the monsters asleep. With a courage which amazed and delighted Minerva he severed, at one blow, the head of Medusa. The noise awoke the other two, but Perseus, rendered invisible by the helmet of Pluto, easily escaped. He made his way through the air with Medusa's head yet reeking in his hand, and from the blood which dropped from it as he flew, sprang those innumerable serpents that have ever since infested the sandy deserts of Libya. The destruction of Medusa rendered the name of Perseus immortal, and he was changed into a constellation at his death, and placed among the stars with the Head of Medusa by his side.

While the observer's gaze is fixed on this portion of the sky it is well to note another region of faint stars enclosed by the Lynx, Auriga, Perseus, and Cassiopeia. These comprise the constellation Camelopardalus, the Camelopard or Giraffe. This group conains fifty-eight stars, of which five only are as bright as the fourth magnitude. This is one of the few constellations that have been named within historic times, having been christened by Hevelius, a Polish astronomer, about the middle of the seventeenth century.

Let the observer now face the east and direct his gaze to an altitude of about thirty five degrees and he will see, just at the Milky Way, two stars about five degrees apart, and the line joining them nearly perpendicular to the horizon. The lower of these is of the first magnitude and the upper of the second. This is the principal group of the constellation Gemini, the Twins, and is the third zodiacal constellation. Their names are Castor and Aollux, the the latter being the lower one. In Roman mythology Castor and Pollux were twin brothers, sons of Jupiter and Leda, and were noted, the former for his skill in horsemanship, and the latter for his physical prowess as shown in boxing and in the use of weapons. They accompanied Jason on his Argonautic expedition and during a violent storm two flames of fire were seen to play around their heads. Hereupon the tempest immediately ceased and the sea became calm.

From this circumstance marinerr concluded that whenever both fires appeared in the sky it would be fair weather. After St. Paul had been wrecked on the island of Melita, he embarked for Rome in a ship whose sign was Castor and Pollux. See Acts, 28, 11.

"Back comes the chief in triumph
Who, in the hour of fight
Hath seen the great Twin Brethren
In harness on his right.
Safe comes the ship to haven,
Through billows aud through gales,
If once the great Twin Brotheren
Sit shining on the sails.—*Macaulay.*

Institute Notes.

It fell to the lot of Section B, Entomology, and Section D, Ornithology, to hold the last meeting of the passing century in the Institute rooms. With the beginning of the season's work last autumn, these sections decided to unite, for a few months, in the study of vertebrate zoology, as a fitting preparation for the special work of the coming spring in the bird and insect world. The meetings have been well attended and a high degree of iuinrest has been manifested. The course of study began with a general view of the vertebrate type, after which a long leap was taken and the class Mammalia was studied with special reference to dentition and cranial development. This done, it was proposed to return to comparatively near the beginning and again work forward, so the last night of the Nineteenth Century found the sections in Entomology and Ornithology assembled for the study of the Fishes.

New Books.

MUSHROOMS, EDIBLE AND POISONOUS, by George Francis Atkinson, professor of botany in Cornell University, is the latest contribution to books on mushrooms. It describes more than two hundred species and is profusely illustrated. The arrangement of the text is scientific and keys enable one to find the different genera without difficulty. It is a valuable aid to the study of fungi. (Andrus & Church, Ithaca, N. Y.)

WILDERNESS WAYS, by William J. Long, is the second series of sketches of birds and beasts of which Ways of Wood Folks was the first. It is one of those refreshing books that one does not lay down till it is finished. The tales of wild life in the New Brunswick woods are different from most similar accounts and therein lies their attractiveness. (Ginn & Co., Boston.)

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Some Winter Birds.

BY A PINFEATHER ORNITHOLOGIST.

There was little to interest the bird seeker during the months of December and January of this winter. From December 1st to January 15th the list of the writer, although she spent three mornings a week in the field, contained only the following birds. It is only fair to say that the list is compiled by two members of the family, so it is really what four eyes, instead of two, have seen. Here it is: Shrike, chickadee, blue-jay, downy woodpecker, goldfinch, white-breasted nuthatch, herring gull, crow, tree sparrow, snow bunting, merganser, robin and partridge. Of these, the snow bunting, (Plectrophenax nivalis) seen on the 11th and 12th of December in the same locality in a flock of fifty or more, just after a snow storm, disappeared when the snow did on the 13th and have not yet returned to any of the localities visited by the writer; nor were they on her last winter's list.

The most interesting discovery made was a little colony of sheldrakes (Merganser americanus) found three times in December and once in January, on the unfrozen pools in the Merrimack river around Goff's Falls. It is a well known fact that these birds frequent these open parts of the river from October until, by freezing over, the mergansers are deprived of the greatest item in their menu. Their toothed bills and habit of swimming under water make them good fishers, and although they live also on berries, pulse, worms, frogs, mollusks and crustaceans, it seems as though this region could offer them little in the way of these varieties to their regular diet of fish. The flesh of this sheldrake, at least that of the adult bird, is so fishy in its flavor as not to be edible, and hence it escapes the man with the gun more easily than its relative, the hooded merganser.

Flying with these birds was an adult herring gull (Larus argentatus smithsonianus). The writer had already seen him from a car window, circling above the deep pool in the Merrimack, opposite Martin's Ferry, on December 3, and here he was again on the 20th, a most unexpected, though well known, guest. He had, contrary to "all the rules of all the schools," been a frequent visitor, from June to October, to the island of Martha's Vineyard, where the writer made a careful note of every time she was so fortunate as to see him and his children there. If it was odd to find him so far south as Vineyard Sound during the summer, it was more so to see him sixty miles inland from Boston harbor, looking for fish in a place where man never would go for that purpose, and where the great railroad traffic and mighty factories would daunt most birds.

December was so warm and snowless a month, near Manchester, that many days were spent by the writer, afield with her Lemaire. Her reward was six robins, a shrike impaling some frozen dainty on a thorn, and the tree sparrows, (Spizella monticola). These last were hopping on the

ground under the pines near Merrill's Yard and the brick schoolhouse on the Derry Road. Such aggravating things as they were! Sometimes as silent as death, sometimes singing a faint, sweet little winter song, they always managed to stay just out of sight by keeping a twig or a spray of leaves between them and their curious visitors. It was fully half an hour before the writer could successfully observe any distinctive markings, but when the rufous head and the very clearly defined whitish wing bars were seen, there was no longer any doubt, and down he went on to the December list. He has been seen twice by the writer since then, in the same locality, when he deigned to show the "bullet hole" spot in his breast.

As for the robins, December and early January had been so warm and seductive that some lilacs had been betrayed into putting forth leaves, and so it may be supposed the robins were deceived also as to the real season of the year. Since the coming of the snow, the birds have failed to show themselves to the writer. To the suet lumps, hung in the apple trees in the yard, the woodpeckers and the nuthatches come in much smaller numbers than last year. So far there has been no Canadian nuthatch (Sitta Canadensis) and no male downy woodpecker (Dryobates pubescens). The female downy comes once in awhile, sometimes making that call note which sounds so like a stonecutter's chisel at work, sometimes clinging unconcernedly to the suet in company with one or more English sparrows, when she does the eating, and they sit still and look suspicious and imposed upon. Shrikes are said to be unusually plentiful this season. Can it be that their presence has frightened away the smaller birds, or is it not a good larvae year? Be the reason what it may, there are certainly not nearly so many nuthatches, chickadees and woodpeckers in the writer's haunts as there were last year. The most careful search has failed to reveal a golden-

crowned kinglet (Regulus satrapa), which we have good reason to believe ought to winter around Manchester.

Ferns and Fern Allies. V.

BY FREDERICK W. BATCHELDER.

In these latter days, when the once frightful word "evolution" has come, in reverent minds, to mean simply God's way of making things, the study of the relationa of plants and groups of plants to each other has become more fascinating and more fruitful than the study of the plants themselves.

FIG. 1.

Almost the first question we ask about a given plant is, what are its affinities? We wish to know its place in nature, its ancestors, its present allies, whether it belongs to a type which is advancing or retrograding, and even what its future prospects are in the struggle for existence. It is in the study of its affinities that the family under consideration, the adder-tongue family, is receiving the attention of botanical specialists to a degree altogether out of proportion to its present standing in the plant kingdom. The family is literally in reduced circumstances. Against the Polypodiaceae, with 70 or more genera and

3000 or more species, it can show only three genera and a few over 20 species.

There is abundant evidence that the Ophioglossaceae now in existence are but the scanty remnants of a group which formerly was widely distributed and which successfully competed with co-existing plants long before the specialized forms now common were evolved. While Ophioglossum, as we find it today, may be very unlike the first fern-plant (pteridophyte) which branched off from the pre-existing moss-plants (bryophytes) it is more like what that plant must have been than any other plant at present known. Even could the theory of some students that our plant is an instance of reversion be proved it would not alter the case. This little plant, then, (Fig. 1) is a representative, probably a direct descendant, of the earliest fern-plants, which appeared away back in the first part of the paleozoic era. Up to that time the structure of all plants, algae, fungi, liverworts, mosses, had been cellular, though prophesies of a more advanced structure might have been observed in certain liverworts, ancestors of the curious "hornworts" (Anthoceros) now in existence. This advance in structure was accomplished by means of the arrangement of certain cells longitudinally in such a way as to form what are called vessels. A more rapid and efficient circulation was thus established and the evolution of the higher, more complex plants rendered possible. In this way from cellular cryptogams (liverworts and mosses) arose vascular cryptogams (fern-allies and ferns). Forms allied to hornwort (Anthoceros) had the most complex structure of any liverwort, and forms allied to adder-

Fig. 2.

tongue had the least complex structure of any fern-ally. The cellular cryptogams, or bryophytes, and the vascular cryptogams, or pteridophytes, here approach each other very closely, as closely as could have been expected considering the immense number of intermediate forms which must have perished in the struggle for existence.

Fig. 3.

The little plant called by the unpleasant name is thus intensely interesting, both as a connecting link between two grand divisions in the plant world, and as the simplest vascular plant known to exist. As you will see from figure 1, it consists of a root, stem and leaf. The leaf is in two portions, called the fertile and the sterile segments. The sterile segment is a leaf-like expansion; the fertile segment is a sort of spike, bearing the coalescent sporangia in a double row. This type is pretty closely adhered to in all the species, though there is a curious exception in O. palmatum which has the sterile segment palmately divided. We possess locally the single, almost cosmopolitan, species O. vulgatum. In the West and Northwest are found two or more additional species, and the prospect is that more may be added as further explorations are made in those regions.

Were the family represented with us only by the genus Ophioglossum we should be likely to consider it very restricted and in a fair way to become extinct at no distant date. The allied genus Botrychium shows signs of greater adaptability to modern conditions. Both by the vastly greater number of individuals it produces and by the polymorphic character it manifests within

specific limits the genus displays superior vitality. Moreover, between the simplest and most complex forms within the genus there is an almost unbroken succession, so that hardly another genus of plants presents so striking a series in evolutionary sequence. From the lowest species in development, B. simplex, (FIG. 2.) to the highest, B. virginianum, there is an enormous advance in structure, the former being extremely close to Ophioglossum, the lowest of all pteridophytes, the latter approaching the true ferns, the highest of the pteridophytes, almost as closely.

FIG. 4.

While the exact order of succession in the species of Botrychium must as yet be a matter of conjecture a convenient arrangement has been adopted depending on, 1st. the situation of the bud for the next year's growth, and, 2nd. the character of the "vernation," i. e. the way in which the parts of the leaf are developed with relation to each other in the bud itself. The following list, including the seven species at present known to grow in New England, is arranged as nearly as possible according to the above system. For the benefit of observers the relative abundance of the plants in this locality (Manchester, N. H.) is indicated.

1.	Botrychium	simplex.	Very rare east of the Connecticut river.
2.	"	lunaria.	(FIG. 3). Connecticut. A possibility here.
3.	"	tenebrosum.	(FIG. 4). Probably abundant here.
4.	"	matricariaefolium.	Rather common.
5.	"	ternatum.	Common.
6.	"	lanceolatum.	Not common.
7.	"	virginianum.	Common.

With reference to the situation of the bud the first six species are alike. In them it is wholly enclosed in the base of the stalk. In No. 7 it is enclosed in a cavity at one side of the base of the stalk.

With reference to the vernation there is greater variety. In simplex, the fertile and sterile portions of the young leaf are both straight. From this simplest arrangement there is a continuously increasing tendency of the parts of the leaf to bend downward. In Nos. 2, 3, 4 and 5, the apex is more or less turned down, while in Nos. 6 and 7, the whole segment is turned down, or, in technical language, the "vernation is wholly inclined." The most interesting point here brought out is that both the change in the situation of the bud and the maximum of inclination in its parts occur in that species which has undergone the greatest amount of specialization, which has attained the highest vegetative capacity, and which approaches nearest to the type of the true ferns, and very nearly indeed to the genus Osmunda, the connecting link. [See Vol. I. No.5, p. 65, and No. 6, p. 90.]

Will not those who read this article try during the coming season to make observations of this interesting class of plants? The very elusiveness of them enhances the charm of the search. Who finds a new station of Ophioglossum gets a feather in his cap! I know a bit of meadow at the foot of a wooded hill where it grows in abundance. The plants are taller and slenderer than those which are found in hillside pastures. The long, thread-like roots scarcely strike into the soil, but twine themselves about the roots of the slender sedges and may be extricated easily from the soft, pillow-like hummocks.

Then there will be the delightful possibility of finding botrychiums not hitherto credited to this region. There will be the probability of finding the rarer species, to say nothing of new or rare varieties of familiar species. Above

all, there will be the opportunity, for those who possess ambition, patience, and a little skill in manipulation, of observing, in the most favorable conditions, some of those wonderful processes of development through which lower forms are gradually replaced by higher forms so that the never ceasing round of change, elimination, adaptation and selection carries the whole created world upward and forward, toward, if never to, perfection.

Florida Bird Notes.

BY ELLA HOPE.

The first sounds that I generally hear in the morning come from the jays, mocking-birds or cat-birds, but a woodpecker was evidently trying to force an entrance, a few mornings since. The red-cockaded ones are common.

I have looked in vain for a robin. I hoped to find that old friend, as Chapman says that enormous flocks are to be seen about the China trees after the berries. The trees full of berries are here. but where do you suppose the red-breasts are?

Ever since my arrival here I have seen some birds which tantalized me, and yesterday came to the conclusion, after better views, that they were the American pipit, their constant movement of the tail being very marked, color, size, running, etc., corresponding to description, but I have been puzzled, for most of the birds are very restless, more like the Fall migrations than the Spring. Several birds may be seen in one flock, which produces confusion, especially when they resemble one another.

The much-abused, or abusive, English sparrow, which I had considered omnipresent, is missing. I am told that they are annoyed at the store by the white-throated spar-

rows, which fly in, but I have seen but one bird which suggested sparrow—I thought that a white-throat.

On one occasion I heard sounds suggestive of the jays, and, looking all about, seemed to find one in miniature, but suppose the wee bird was a white breasted nut-hatch. With his long bill he went exploring all possible lunch stations on the umbrella tree, keeping up his cry almost continually. I had only a gilmpse of him with my glass, but hardly believe I have misnamed the visitor.

An unidentified blackbird flew overhead. There are plenty of the dusky brethren (in feathers) about and of different families. I saw a large flock of cow-birds one day, and near them was a band (much interested in me) of large and small darkies, together. I believe they were boat-tailed grackles, known locally as jack-daws.

C. J. Maynard says that the white-bellied swallows are the only ones found here in winter, so I need not attempt to follow the swift flight of the swallows which show so much white as they fly.

Phoebe sits on the persimmon tree, taking short excursions and snapping his bill when he resumes his perch, or going to a near-by post to repeat the maneuver.

Loggerhead shrikes are common callers, though silent ones. My friend says she has often found beetles, not birds, impaled on the orange thorns. The several that I have seen have evidently been hungry, for there was no storing up for future needs nor wanton killing.

The buzzards are always in sight unless you are looking for some, and their curious flight interests me greatly. When three of them are sitting on the six-foot ridge-pole of a low hen-house and several posts of the clothes line are occupied by birds as big as Thanksgiving table centerpieces with the "dusters" on, the picture is a striking one.

The tide was in most of the time while I watched yesterday, so the wading and other water birds were not "in it,"

but during the day, I saw a dark heron go hurrying, half running, half flying, after his dinner. They forget their dignity when in a hurry.

A flock of small birds. evidently moved by one spring, rise at the same instant, circle several times over the water, uttering a shrill, not unmusical cry, and settle with a common impulse to feed. As they show much white in their flight, they are noticeable at a distance. I am told they are plovers.

The kingfisher has a curious habit of poising in the air, high over the water, and balancing with rapidly moving wings, until he darts after a luckless fish he has spied. If he finds he is not going to make a hit, he changes his plan and, in the most nonchalant fashion, pretends he was just taking a little exercise.

An attractive sight was a flock of six or seven white cranes, pointed out, as they flew, by a native "cracker." Questioning the colored children has brought out some interesting information in regard to "crames," jay-birds and so forth. I was solemnly assured, when I pointed out a kingfisher, "dat we calls dem eagles!"

I find that "by book and by look" the Florida jay lacks the prominent crest worn by the relative common to the North and South.

With the mention of a woodpecker with a red head my chapter closes.

Tarpon Springs, Fla., Dec. 30, 1900.

The Institute has secured for its museum the woodchuck's head described in the last number of NATURE STUDY.

The comparative rarity of the winter birds, commonly abundant in this vicinity, commented upon by "Pinfeather Ornithologist," has been generally noticed by observers this winter. We do not appear to be reaching an explanation; but it is well that the question has been raised.

How to Find the Constellations. VIII.

BY GEORGE I. HOPKINS.

If the observer will face the south on any clear night during the first week of February, at about eight o'clock, he will readily discern three stars in a row, at an altitude of about forty-five degrees, i. e., about half way from horizon to zenith. The two outer stars of this row are almost exactly three degrees apart, and the line joining them, when in this position, makes an angle of about forty-five degrees with the horizon. There is no possibility of mistaking these, as there is no other group visible that at all resembles them. If the observer's eye will now trace a line through the central one of this group and at right angles to the line joining them, he will see, about ten degrees on either side, a star of the first magnitude; the one toward the east is the red star Betelgeuse, and the one toward the west is Rigel, another of Ben Hur's horses. About seven or eight degrees westward from Betelgeuse and at an altitude somewhat less is a star of the second magnitude, named Bellatrix. Eastward fom Rigel about ten degrees is a star of the third magnitude, named Saiph. These stars form the most prominent group in the heavens, and constitute, with about seventy others, the constellation Orion, the mighty hunter. Just above the line joining Betelgeuse and Bellatrix, and about midway between them, is a small close group of faint stars which locates Orion's head, the two stars above mentioned being in his shoulders. The three first mentioned, the highest of which is named Mintaka, is his belt, while Rigel and Saiph are at his feet. In some star maps, however, these latter are pictured as locating his knees. Most star maps represent him facing the bull (Taurus), with his right arm uplifted and brandishing

a huge club. From the lowest star in the belt, named Alnitah, extends downward a line of rather faint stars, somewhat curved, about four degrees. These constitute the sword.

The belt is sometimes denominated the *Three Stars*, because, as was stated above, there is no other group like them in the whole visible heavens as regards position and brightness. They have also been called the Three Kings, because they point out the Hyades and Pleiades on one side and Sirius, the Dog Star, on the other. In Job they are called the "bands of Orion," while the ancient husbandman called them Jacob's Rod and sometimes the Rake. In 1807 the University of Leipsic gave them the name of Napoleon, but the more commom name for them is the Yard, doubtless bestowed from the fact above stated that the two end stars are just three degrees apart and the line joining them is divided into two equal parts by the third star, very like the divisions of a yardstick. Like the latter, they also serve as a unit to measure the distances between other stars. The line of stars constituting the sword is also sometimes spoken of as the Ell, because it is about once and a quarter times the length of the Yard. Commonly they are mentioned in connection with each other as the Ell and Yard.

Beautiful and magnificent as this constellation is to the lover of the stars, as a group, equally so are they individually when seen through the telescope, all the stars, as above mentioned, being double except Mintaka and Saiph. Besides this, the star Theta, in the sword, is a multiple star, showing four components in an ordinary telescope, so arranged as to form a four-sided figure called a trapezium. This is the so-called Trapezium of Orion, and is surrounded by a large irregular nebula, the most conspicuous in the whole heavens.

Whoever once looks up to this constellation and learns

its name will never forget it. It is too splendid to need a description, and when it is on the meridian, as now, there is presented to the gaze of the enraptured beholder the most magnificent group of stars the firmament affords. As the celestial equator passes through the center of this constellation, the star Mintaka being less than half a degree from it, this group is visible to all the habitable world. It is no wonder, then, that this group, more than any other, has been the theme of the poet's art.

"First next the Twins, see great Orion rise,
His arms extended stretch o'er half the skies;
His stride as large, and with a steady pace,
He marches on, and measures a vast space;
On each broad shoulder a bright star displayed,
And three obliquely grace his hanging blade.
In his vast head, immersed in boundless spheres,
Three stars, less bright, but yet as great, he bears,
But farther off removed, their splendor's lost;
Thus graced and armed he leads the starry host." —*Manilius*

The mythological accounts of Orion vary considerably, one of which is as follows: Orion was the son of Neptune and Queen Euryale, a famous Amazonian huntress, and possessing the disposition of his mother, he became the greatest hunter in the world, and even boasted that there was not an animal on earth which he could not conquer. To punish this vanity, it is said that a scorpion sprung up out of the earth and bit his foot so that he died. At the request of Diana he was placed among the stars, directly opposite to the scorpion that caused his death.

Orion rises at noon about the tenth of March, and so was supposed by the ancient mariners to be the cause of, at least accompanied by, great rains and storms. In consequence it became a source of much dread to the early navigators. Virgil refers to this in at least two places, as when Æneas accounts for the storm which cast him on the African coast while on his way to Italy.

"To that blest shore we steered our destined way,
When sudden, dire Orion rous'd the sea;
All charged with tempests rose the baleful star,
And on our navy pour'd his watery war."

Again, to induce Æneas to delay his departure, Dido's sister advises her to

> "Tell him, that, charged with deluges of rain,
> Orion rages on the wintry main."

Directly below Orion, and comprising a space about fifteen degrees square, is the constellation Lepus, the Hare. There is no prominent group by which it can be located, for the brightest stars are only of the third magnitude. Of these there are four that are from about two to four degrees apart, forming a trapezium that can be seen distinctly only when the sky is clear.

Immediately below Lepus, and comprising the space between that group and the horizon, is the constellation Columba, Noah's Dove. It contains ten stars, only one of which is of the second magnitude, and can seldom be seen in the latitude of Manchester.

Immediately west of Lepus and that portion of Orion below the equator, is a large region of faint stars extending westward about thirty degrees and nearly to the horizon, being narrowed in the middle to about fifteen degrees. This is the constellation Eridanus, the River Po. The lower portion extends considerably farther to the westward, until it vanishes below the horizon. It is of quite irregular shape, and it is not easy to trace all its windings among the other stars. In all there are eighty-four stars in this constellation, only one of which is of the first magnitude. The name of this star is Achernar, and is situated at the extreme southern end of the stream, being only about thirty degrees distant from the south celestial pole, and, consequently, never visible in this latitude. It has also one star of the second magnitude, Beta, situated about four or five degrees above, and a little to the west of, Rigel. In some maps this star is represented as forming a part of Orion, being situated on the shinbone near the knee.

Turning now eastward from Orion and fixing the gaze at an altitude of about thirty degrees, one can see the

brightest star in the whole heavens, Sirius, the Dog Star. About ten degrees below Sirius, and somewhat farther eastward, is a group of three stars, forming a right-angled triangle with the hypothenuse nearly parallel with the horizon. These, with Sirius and the fainter stars between and adjoining, to the number of thirty-one, constitute the constellation Canis Major, the Greater Dog.

In the remote ages of the world, when every man was his own astronomer, the rising and setting of Sirius, or the Dog Star, as it was called, was watched with deep and various solicitude. The ancient Thebans, who first cultivated astronomy in Egypt, determined the length of the year by the number of its risings. The Egyptians watched its rising with mingled feelings of hope and fear; as it was ominous to them of agricultural prosperity or blighting drouth. It foretold to them the rising of the Nile, which they called Siris, and admonished them when to sow. The Romans were accustomed to sacrifice yearly a dog to Sirius, to render him propitious in his influence upon their herds and fields.

It was a common belief among the nations of the East generally, that the rising of Sirius would result in great heat upon the earth. This was voiced by the poet when he said:

> "Parched was the grass, and blighted was the corn;
> Nor 'scape the beasts; for Sirius from on high,
> With pestilential heat infects the sky."

This same belief is shared by a great many people of the present day, modified to some extent by the the additional idea that dogs are more likely to "go mad," i. e., be afflicted with hydrophobia, than on other days. Of course a little reflection will show that there is not the slightest foundation for such a belief, as Sirius rises and sets every day of the year, being invisible in the summer time because of the superior brilliancy of the sunlight.

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Ferns and Fern Allies. VI.

BY FREDERICK W. BATCHELDER.

As was stated in the first article in this series, (See Vol. 1, No. 5.) all the local ferns may be considered as belonging to three families, of which the typical genera are Ophioglossum, Osmunda and Polypodium. The order in which the names are given also indicates the order of natural development, the first family containing the most ancient and least specialized forms, the third, the most modern and highly specialized forms, while the second constitutes a connecting link, but recently recognized, between the other two. This second family is not so much a bridge as the remains of a bridge over the chasm between the so-called "eusporangiate" and the "lepto-sporangiate" ferns, between those in which the sporangia are formed from the interior tissue of the leaf and those in which they are derived from a single epidermal cell. Doubtless many other intermediate forms have perished and left no sign.

Attention was called in the last article to the enormous dis-

proportion between the number of genera and species as well as of individuals in the first and third families. The adder-tongue family can show only three genera and a few over twenty species against the seventy or more genera and three thousand or more species of the polypody family. As to the intermediate family, it possesses, beside Osmunda, with six species, one other genus, Todea, with four known species, native of Australasia and South Africa. It is not so much the fact of this disproportion as the cause of it which is of vital interest. The archaic forms have one by one passed away because they were not adapted to the new conditions of life. The few that remain are those which have succeeded in temporarily staving off impending destruction by a partial adaptation to modern environment.

FIG. 1.

On the other hand, the immense increase in numbers in the family of which Polypodium is the type, is the result of a high degree of specialization, amounting, in fact, to adaptation to almost any and every condition of plant life in the present state of the earth's surface. The possible habitats of Ophioglossum and Botrychium fare, by comparison, very restricted. With few exceptions, the species require a rich soil, partial, but not excessive, shade, and the non-intrusion of stronger plants. On the other hand, the Polypodiaceæ have succeeded in accommodating themselves to habitats of extremely diverse character. From Ceratopteris, (horn-fern), which is strictly aquatic, the possibilities of habitat range through all degrees of moisture and dryness to the bare cliff, where

"small ferns fit
Their teeth to the polished block"

and not only can they grow in all these diverse environments, they can also hold their own against the encroachments of more highly organized plants. Finally, while their ancient cousins are restricted almost entirely to cool or temperate regions, they thrive nearly from pole to pole, and reach their finest development in subtropical and tropical regions. Witness Bermuda, with not less than four hundred species, some of them comprising the great tree-ferns forty or more feet high and with a stem, botanically a "caudex," simulating the trunk of a good sized tree.

FIG. 2.

It is specialization, then, which has enabled modern ferns to hold their own so extensively against the encroachments of the seed-bearing plants. Before entering into the study of the Polypodiaceæ, as a family, it may be well to consider the relation of specialization to evolution in general. Specialization is the development of a certain plant form along certain well defined lines, for the accomplishment of certain ends. It is therefore only one phase of evolution. If evolution be represented diagrammatically by a line ascending from left to right, specialization may be represented by a horizontal line from left to right. So if we choose to represent the whole progress of evolution in the plant world, by such an ascending line, the various specializations which have arisen will be represented by as many horizontal lines striking off from that line. The idea I wish to convey is, that specialization is a check to general evolution in the class of plants in which it has taken place. Therefore it follows that not the

more specialized but the less specialized forms give rise to higher forms in the evolutionary series. To illustrate from the history of the plant kingdom. This kingdom has been subdivided by different systematists. For present purposes it will be sufficiently correct to adopt the division into four sub-kingdoms, 1, Thallophytes, 2, Bryophytes, 3, Pteridophytes, and 4, Spermaphytes. The first sub-kingdom includes Algæ, Lichens and Fungi; but since Fungi are, if in this order at all, degraded plants, and Lichens are a combination (symbiosis) of Algæ and Fungi, we may consider only the Algæ. Of these there are four classes, Blue, Green, Red and Brown Algæ. The Red and Brown Algæ reached by far the highest degree of development as Algæ and have undergone the greatest amount of specialization, so that they constltute the greater part of the known plants of their class. It was not from them, however, but from the comparatively insignificant Green Algæ, that the primal members of the next sub-kingdom, that of the Bryophytes, were evolved.

FIG. 3.

Next: the Bryophytes comprise the Liverworts and the Mosses. Today everyone knows what the Mosses are; great areas of the globe are clothed with them. But who, outside the limited circle of somewhat advanced botanists, knows three Liverworts? Yet it is from them, and not from the enormously specialized Mosses, that the first fern-plant, the mysterious ancestor of Ophioglossum, was evolved.

Next: the Pteridophytes comprise the Fern-Allies and

the Ferns. In this case the line of advance into the next sub-kingdom is not yet easy to trace; but enough is known to assure us that the earliest Spermaphytes sprang from comparatively simple, non-specialized members of the sub-kingdom below. Thus, it is thought that the Gymnosperms (pines, palms, etc.) were derived from near relatives of Lycopodium, a comparatively insignificant plant at the present day, and the Angiosperms from some member or members of the more archaic, less specialized Ferns.

But there is always danger of carrying generalization too far and of anticipating the results of study. So I must close with the warning that we as yet know little about the history of plants in past geological ages. Future discoveries and investigations and comparisons may materially alter the present aspect of relationships in the plant world.

The figures are supplementary to these previously given.

Fig. 1. Botrychium matricariæfolium.
Fig. 2. " lanceolatum.
Fig. 3. " virginianum. A very small plant.

For descriptions, see Vol. I, No. 8, pp. 119–121.

Nuthatch Ways.

In her natal down the Pinfeather Ornithologist had a ridiculous fancy that nuthatches were called by that name because their eggs looked like nuts. She never had seen their eggs, but this was her interpretation of the name. "A bittern," she said to herself, "is called a stakedriver, and he does not drive stakes; why should not the nuthatch be called nut-*hatch* if it does not hatch nuts?"

This looked as reasonable as any other theory to the ornithologist just out of the shell. She learned better as she grew older, and yesterday had a near view of the real rea-

son Sitta carolinensis is called nuthatch. On the apple-tree (in the heart of the town) she had nailed a cigar-box and filled it with uncracked peanuts. These have stayed there in almost undiminished numbers for three months. February 4th there was so heavy a storm that the peanuts were covered by a mountain of snow six inches high in the center. February 6th, during a very cold northwest wind, a female nuthatch came to the cigar-box, stood on the edge, perching, as best she could (you never see a nuthatch perch on a *small* twig or branch), and, burying her head in the snow she burrowed and shoveled away until she reached a nut. This she pierced with her bill, and somehow managed to fly away with it to a tree. Here she wedged it between a bit of bark and the trunk, and shelled it. She then split it in half, flew with one section to another tree, crammed it between crevices in the bark, and had a feast to her liking, while she hung on the sheltered side of the elm, safe from the strong wind. I called the bird a female because the back of the head and between the wings the color was decidedly more gray than bluish-gray. Nuthatches were originally called "nut-hackers." (I write this for the benefit of any who may be in a state similar to the writer's earlier one of ignorance.)

What mistakes they make—the beginners! A club woman recently wrote and read to her club that "the cow-bird never laid any eggs of her own, but relied upon the eggs of other birds to reproduce her own kind." This is vouched for as being a bona fide story, and it has this virtue, that it is a consolation when one is considering all she does *not* know about birds.

A nuthatch has been reported to the writer as having performed an acrobatic feat of no mean agility this winter. The narrator had hung a lump of suet by one long string to a tree in his yard. He one day had this amusing spectacle presented to him: The nuthatch, at the top of the

string, grasped it firmly with both feet and, head downwards, slid the entire length until he reached the suet. But that was a Harvard College bird—our own nuthatches are not so athletic.

Winter Gems and Secrets.

BY SUSY C. FOGG.

IN the winter season of ice and snow, insect life is apparently at a low ebb, and it is only by some show of real interest on our part, that Nature is willing to betray the secrets of her wonderful provision for the return of her children in the spring. Where do they go and how do they live in the cold days that are upon us?

These are some of the places that may be searched, and not in vain: In the beds of running brooks and ponds active life abounds at all seasons of the year, but those insects which live surrounded by air generally pass the winter in a dormant condition. Look among the raspberry canes and notice here and there the rough places upon the bark. By making a lengthwise slit with your knife along this line of punctures, you may discover a row of yellow egg-cases imbedded in the pith. The brood of Snowy Tree Crickets is assured for another summer, if all goes well, and will help to swell the chorus on late August nights, when time is too precious to sleep and there is music and a stirring almost equal to that of day.

Near by, in the brambles, is the nest of the carpenter bee, and the mother bee herself is waiting there and watching for the time when her family will be matured.

Under the bark of trees, the chickadees and woodpeckers will show you where, are countless numbers of eggs

which are the beginnings of as many little lives. The young locusts will come forth from cells in the ground with the first warm, dry days of spring. When the earth is again spaded for the planting season, or as you rake away the leaves in the woods, or take a peep beneath stone or decaying log, you may come upon curious mummy-like structures, brown and shining; or, swathed in a tough outer covering of silk or parchment, similar cases may be found attached to dried stalks or twigs of trees. Out of these cocoons will come moth, butterfly or beetle, glad creatures that are soon to share, for the first time, in "the glory of this world of sunshine, love, wings and music."

Old fences, a woodpile or shreddy stump will often reveal much in the way of egg, larval or adult life. A pleasant recollection comes to mind of finding, on a sunny day of last spring, a pretty butterfly in the crevice of an old stump in the woods. Though a warm day, the wood was still full of frost, and the butterfly had not felt the awakening touch. Its graceful wings of dull chocolate brown were still closely folded upright, showing a pale yellow band along the margin, but none of the warmer tones and blue spots on the upper side. The resemblance of the indistinct lines to frost crystals rendered its protection complete. You smile and say, oh! yes! Vanessa antiopa, or Mourning Cloak, known also to the children of England as the Camberwell Beauty. It not infrequently takes a short flight in some sheltered nook, even in winter, as does the Compton Tortoise

At other times the social wasps are to be seen lamely crawling about on the side of the house or over the snow. and the common little round red and black ladybug makes its appearance on the windows, walking carefully up one side or running down the other in great haste.

These are some of the insects that belonged to the fall brood and live over till spring, which seems to them, per-

chance, like living in three centuries. Indeed, some have that appearance, for they often become faded and torn and lose much of their beauty.

But, certainly, you would say, the more fragile species cannot endure the rough cold, yet on the thirteenth day of December, there was captured on the wall of a room and brought to my notice a frail bit of insect life, less than nine millimetres in length. It was pale yellowish in color, and in strong light suggested "a little airy thing," of which Wm. Hamilton Gibson wrote, "with a glistening sunbeam for a body and wings of tiny rainbows."

I found a similar one among my own collection, taken a few weeks earlier, but the members of the same family are often found upon the snow in late winter or early spring. This particular insect was Micromus insipidus, of the family Hemerobidæ, and is closely related to the "Dobson," the ant-lion and aphis-lion, or "Golden-eyes," the pretty little being with green lace wings which hovers over the grass and clover fields in summer time. They all have an old-fashioned air about them, and a likeness in wing structure, but though the wings are strongly veined, these insects are feeble fliers. What they lack in strength seems to be made up in great beauty.

The wings of Micromus are very glassy, and the pale veins are broken by fuscous interruptions; the fore legs are prettily banded, and the antennæ are beaded like a necklace. This small insect, which is but one of the winter gems, remember, long ago made a pretty study for the scientist and has been carefully described. Those who are willing to make a study of even small things may be abundantly rewarded in their search after truth and beauty.

Woodpecker Architecture.

BY EDWARD J. BURNHAM.

When a lad, the attempt was once made to imitate, with a pocket-knife, the work of a woodpecker in excavating its home. The nest selected as a pattern was in a maple about six inches in diameter. The tree was dead, but had not been greatly mellowed by time, as the trial proved. Half an hour's hard work with the knife-point left a more lasting impression upon the mind than upon the tree. It is probable that the woodpecker uses its beak both as a chisel and a forceps, the combination affording an evident advantage over the knife-point; but even so the task is formidable. To drill a horizontal tunnel, two inches in diameter and five inches deep, in comparatively hard wood, is not light work; but, if a nest is intended, much more must be done, for a vertical shaft is to be drilled in the direction of the grain, in the case of the hairy woodpecker, four inches in diameter and six inches deep—and all this to be accomplished by a bird less than ten inches in length from tip to tip, by means only of a sharp beak and the muscles of a somewhat slender neck. But the little architect, like a good carpenter, evidently takes pleas-

FIG. 1.

ure in his task, for not only do the hairy and downy woodpeckers make holes for nests, probably new each year, but during the winter they drill numerous places for shelter, changing from tree to tree, seemingly as fancy prompts, or as a boy whittles, for the fun of it.

FIG. 2.

When a wood lot near Manchester was "slashed" a few years since, a clump of poplars and ancient birches was left. Fire passed through soon after, killing the trees, and they stand there, with twisted trunks and broken branches, suggesting the picture by Dore in the "Inferno." Here has been a grand opportunity for the woodpeckers and for the naturalist. No fewer than twenty trunks, still standing, have been drilled repeatedly, sometimes for shelter, less frequently for nests, while as many more trees now prostrate had been similarly treated before they fell. Fig-

ure 1 represents a nest of the "hairy," which had evidently been occupied by bluebirds, as it was daintily lined with pine needles. The woodpecker uses his own chips. Figure 2 shows a large birch, in which are seven holes—one evidently the nest of a hairy woodpecker, the others shelter holes, drilled by the "downy," all in close proximity, and, as usual, on the southern side of the tree. Figure 3 represents the nest of a "downy" which was carefully sawed apart and thoroughly studied. In another paper the entomologist will relate what he found upon an examination of the contents.

FIG. 3.

It is easy to distinguish the nest of the "hairy" from that of the "downy," the former being larger and in one respect more complete. The "hairy" bores the horizontal tunnel across the entire diameter of the vertical shaft, the two forming a right angle; while the "downy," more sparing of toil, curves the tunnel downward soon after entering the tree, merely cutting a channel in the roof, and thus leaving a considerable quantity of wood which the "hairy," in shaping his nest, removes.

"Binny" was a notable beaver in his day, and, after the lapse of more than three-quarters of a century, he is by no means forgotten. Binny was unhappy, doubtless, in that he was taken from his home in the Canada forest, but he was peculiarly fortunate, on reaching London, in falling into the hands of Mr. Broderip, the eminent naturalist, who possessed the faculty of writing so entertainingly.

How to Find the Constellations. IX.

BY GEORGE I. HOPKINS.

The observer should remember to take a general survey of the heavens every time he goes out for the purpose of locating new groups of stars and positively fix the position of those already learned, as they are, in a large measure, to serve as guides for the location of the new ones.

Let the observer this time face the north locate the positions of the Great Dipper and Cassiopeia; then note well the other constellations in that region already pointed out. At the left of Ursa Minor and below Cassiopeia is a region of not very bright stars, none being above the third magnitude. The two brightest ones, however, are about six or seven degrees apart and the line between them, if prolonged, would pass through Polaris; being, in fact, a pair of *pointers*, like those in the Great Dipper. They are of less importance than the latter only because of their inferior brightness, and are, perhaps, a little nearer Polaris. At the left of these two, directly below Cassiopeia, and in the Milky Way, may be detected a close group of faint stars, slmilar to that which forms the head of Orion. This is the distinguishing group of the constellation Cepheus, which contains in all thirty-five stars, and extends clear up to Polaris.

Cepheus was King of Ethiopia, and Cassiopeia was his Queen. They were the parents of Andromeda, who was betrothed to Perseus. The story of the latter's perilous expedition to secure the Gorgon's head has already been told. Cassiopeia was famed for her beauty, and, like many a modern one, could not refrain from boasting of it. She even dared to declare herself more beautiful than Juno or the Sea-nymphs. This incensed the latter to such an ex-

tent that they complained to Neptune, the ruler of the sea, of the insult. To punish her for her insolence, Neptune sent a frightful monster to ravage her coast. But this did not suffice to appease their anger or mollify their jealousy so they demanded, and it was finally decreed, that the Queen should have her daughter Andromeda chained to a desert rock on the beach and leave her exposed to the fury and ravages of this monster. Her lover, Perseus, having been made aware of her fate, rescued her just as the monster was advancing to devour her.

"Near to his wife and daughter see, aloft where Cepheus shines,
That wife, the Little Bear and Swan, with Draco bound his lines;
Beneath the Pole-star twelve degrees, two stars your eye will meet—
Gamma, the nomad shepherds 'gem, and Kappa mark his feet.
Alphirk, the Hindu's Kalpeny, points out the monarch's waist;
While Alderamin, beaming bright, is on the shoulder placed;
And where, o'er regions rich and vast, the Milky Way is led,
Three stars, of magnitude the fourth, adorn the Æthiop's head."

Let the observer now direct his gaze to the right of the Little Dipper, and he can see, about half way between the brightest star in its bowl and the star in the angle of the handle of the Great Dipper, a star of about the fourth magnitude. From this it is easy to trace a line of lesser stars curving upward and at the left terminating at Camelopardalus, and also downward to the left reaching to Cepheus, then curving again downward and to the right reaching the horizon exactly in the north, on the boundary line of Hercules. This is the distinguishing group of the constellation Draco, the Dragon, the lower terminus forming the head, and the upper one, the tail. On picture charts his long and tortuous body is represented as having several folds, corresponding to the newspaper representations of the modern myth, the sea serpent.

The star first pointed out is named Thuban, and is interesting from the fact that between 4000 and 5000 years ago this was the pole star. It was then much nearer the pole than Polaris now is. By mariners this star is called the Dragon's Tail, and was formerly regarded as of great im-

portance, being then of the second magnitude.

Turning now to the South, the observer will see that magnificent twinkler, Sirius, almost exactly on the meridian, with Betelgeuse several degrees to the westward. To the eastward, at about the same altitude as the latter, and just about as far from the meridian, is another first magnitude star. This is the principal star in the constellation Canis Minor, the Lesser Dog, and is named Procyon. This is one of the small constellations, containing only fourteen stars, and, according to a Greek fable, is one of Orion's hounds. Between Canis Major below, Canis Minor above and Orion on the right, is an almost starless region on ordinary nights. This comprises the constellation Monoceras, the Unicorn.

Turning now to the eastward, one can see a star of the first magnitude, at an altitude of about forty-five degrees, with a line of stars above it curved in such a way as to resemble the reaper's sickle. The name of this star is Regulus, and it is at the very extremity of the handle. This is the distinguishing group of the constellation Leo, the Lion, and is the sixth of the zodiacal constellations, starting from the vernal equinox, the ecliptic passing within less than a degree of Regulus. At present the ruddy planet Mars appears just below this constellation. According to fable, this is the famous Nemæan Lion which was slain by Hercules and was placed among the stars by Jupiter in commemoration of that dreadful conflict. The lion was and is the emblem of violence and fury everywhere; so it is not surprising to find it in all the Indian and Egyptian zodiacs. In the Hebrew zodiac, Leo is assigned to Judah, on whose standards, according to all traditions, a lion is painted. In the old Hebrew writings several references to this are made. "Judah is a lion's whelp; he stooped down, he crouched as a lion, and as an old lion; who shall rouse him up?" Again, "The Lion of the tribe of Judah has prevailed."

Between Gemini and Leo there is a space occupied entirely by faint stars. This comprises the group Cancer, the Crab, and is the fifth of zodiacal constellations. Since there are no bright stars by which to recognize it, it must be located solely with reference to its neighbors. On a clear night one can see there a hazy spot like a patch of thin mist. In the telescope this is seen to be a magnificent cluster of stars of the seventh magnitude and less, and is termed Præsepe, the Manger. It is also sometimes called the Beehive, and shows up well in a good opera glass.

A Two-Headed Snake.

The museum of the Institute has received from Mr. George I. Hopkins a preserved specimen of garter snake, Thanophis sirtalis, with two well developed heads. It was found. a few years ago. by some boys, near the Merrimack river. The length is about six inches, and most of it is like any ordinary snake. About an inch back from the nose, or noses, the body branches, and two perfect heads are the result. When found it was alive and apparently well able to feed both mouths.

A jar which had contained sweets had been placed on a shelf over a sink where Blatta germanica abounded. The cover was partly open. In four days, or rather four nights as the Croton Bug is not so frequently abroad during the day, over two hundred were suffocated while feeding upon the remainder of the sweets that were still adhering to the glass. Though the jar was not exposed as a trap, the result seems to suggest a very simple and unique manner of being rid of these insects.

Binny's Dam-building.

LEAVES FROM THE NOTE-BOOK OF A NATURALIST.

A beaver arrived in this country in the winter of 1825, very young; being small and woolly, and without the covering of long hair that marks the adult animal. It was the sole survivor of five or six which were shipped at the same time, and it was in a very pitiable condition, lean, and with the coat all clogged with pitch and tar. Good treatment quickly restored it to health; it grew apace, plumped out, and the fur became clean and in good condition. Kindness soon made it familiar. When called by its name, "Binny," it generally answered with a little, low, plaintive cry, and came to its owner. The hearth-rug was a favorite haunt in a winter evening, and thereon it would lie stretched out at its length, sometimes on its back, sometimes on its side, and sometimes on its belly, expanding its webbed toes to secure the full action of a comfortable fire on them, but always near its master.

The building instinct showed itself early. Before it had been a week in its new quarters, as soon as it was let out of its cage, and materials were placed in its way, it immediately went to work. Its strength, even before it was half grown, was great. It would drag along a large sweeping brush, or a warming pan, grasping the handle with its teeth, so that it came over its shoulder, and advancing with the load in an oblique direction, till it arrived at the point where it wished to place it. The long and large materials were always taken first, and two of the longest were generally laid crosswise, with one of the ends each touching the wall, and the other ends projecting out into the room. The area formed by the crossed brushes and the wall he would fill up with hand-brushes; rush-baskets, books, boots, sticks, clothes, dried turf, or anything portable. As the work grew high he supported himself on his tail, which propped him up admirably; and he would often, after laying on one of his building materials, sit up over against it, appearing to consider his work, or, as the country-people say, "judge it." This pause was sometimes followed by changing the position of the material "judged," and sometimes it was left in its place. After he had piled up his materials in

one part of the room, (for he generally chose the same place,) he proceeded to wall up the space between the feet of a chest of drawers which stood at a little distance from it, high enough on its legs to make the bottom a roof for him; using for this purpose dried turf and sticks, which he laid very even, and filling up the interstices with bits of coal, hay, cloth, or anything he could pick up. This last place he seemed to appropriate for his dwelling; the former work seemed to be intended for a dam. When he had walled up the space between the feet of the chest of drawers, he proceeded to carry in sticks, clothes, hay, cotton-wool, etc., and to make a nest. When he had done this to his satisfaction, he would sit up under the drawers and comb himself with the nails of his hind feet. In this operation, that which appeared at first to be a malformation was shown to be a beautiful adaptation to the necessities of the animal. The huge webbed hind-feet of the beaver turn in so as to give the appearance of deformity; but if the toes were straight, instead of being incurved, the animal could not use them so readily for the purpose of keeping his fur in order, and cleansing it from dirt and moisture.

Binny generally carried small and light articles between his right foreleg and his chin, walking on the other three legs; and huge masses, which he could not grasp readily with his teeth, he pushed forwards, leaning against them with his right forepaw and his chin. He never carried anything on his tail, which he liked to dip in water, but he was not fond of plunging in the whole of his body. If his tail was kept moist he never cared to drink; but if it was kept dry it became hot, and the animal appeared distressed, and would drink a great deal.

The editor has given a great deal of time and labor to the compilation of a list of the more common birds of New England. This list, with an English index, and space for notes, has been brought out by the NATURE STUDY press in a tasteful and convenient form for the use of the bird-lover in walks afield. Stout paper covers; 25 cents post-paid.

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An April Day.

BY THEODORA RICHARDSON.

With the early morning light in our faces, we traverse the clods of rich earth, turned up by the plow of the thrifty farmer in the late fall. At last we reach the meadow border. Here we pause to drink in each loved detail of color and life above and around—the oozy mass of green moss, so springy beneath our feet, the carpet of coarse grass, with a few shoots of tender green, the shiny cranberry leaves, among which later may be found orchid treasures to suit the most fastidious, beside many other sweet but less rare wild beauties.

Just beyond are clumps of clustering alders; rustling, waving, dry flag-stalks, and tall meadow-grass, above which still tower the dry seed-pods which may yet furnish many a breakfast to hungry migrants—the white-throats, white-crowns and others. Occasionally a black stump peers from the clustering bushes; and, from ten to twelve feet apart, are dead tree trunks of maples, pines and a poplar or two. Probably these were once on solid ground, but now are partly inundated, standing, in spring, in some six feet of water.

Across the brook, which cannot be seen at this point, rises the clean, old-fashioned church spire, with its quaint

miniature spires on each corner; and, ranged from north to south, are pleasant white farm-houses of the village street, each nestling cosily among its orchard trees.

Two hills, the Devil's Den and Bunker Hill, are the highest elevations in the village, not only serving as picturesque backgrounds for the town but also as points of vantage for some of the most beautiful sunsets and rare bits of New England lake scenery. On the first named hill is a cave of some geological interest, probably the innocent cause of such a cognomen. But what could have been the cause for the name of the adjoining hill is a theme for reflection; it may have served as a warning to the supposed resident of the cave, for it has been said that he is never found at home.

The woods of Devil's Den are now taking on the tender green of opening buds of the birches, and maple buds add to these a bit of coral coloring. The hill slopes to the south, a low range continuing and bordering the lake. Bunker Hill slopes rather abruptly toward the north to comparatively level ground, while behind us rise other hills, clothed in protecting forests, sheltering the fields and orchards next the meadow.

Old Winter's white coat has disappeared and has left the earth like a clean child, ready for the beautifying dress of spring. Do you get that earthy smell from the plowed ground as the little breeze blows toward us and off across the waters of the bog? Hear the water trickling down the bank, and the bubbling springs which feed the waters of the meadow! In the orchards the robins are calling, the bluebirds add a rich trill, now and then the phœbe calls, from the low bush comes the tree-sparrow's soliloquy, the song-sparrows are trying from various nooks to out-do each other, but, sweet and clear above all, the purple finch's song is heard.

Oh! happy thought! We take possession of the dory,

near, and with care and stealth paddle out to watch the life in the bog. From that mound-like hummock of roots and bulrushes emerges the muskrat and silently slips into the deep water, making hardly a ripple, thinking to deceive the keen-eyed observer. Everything seems alive. Now comes a flock of red-wings (mostly males); with dash and clamor they settle on the alders and give a concert never equaled by humans. Catch the flashes of red, as the owners of these bright epaulets vibrate from bush to bush. Then three golden-winged woodpeckers fly over alight on the solitary elm in the intervale, whence we hear their tattoo.

But now come the majestic birds for which we have passed an expectant hour. Circling and wheeling, they at last occupy the uppermost limbs of their favorite dead pines, near the brook's mouth. We are still more than a hundred feet from their position. This year there are three, one an offspring, most likely. How striking is the dress; head snowy white, neck and back soft brown, under parts also white, with sides of breast slightly spotted with brown. Almost motionless they sit, a slight turning of the head the only indication of life, while two eager enthusiasts in the dory feast their eyes upon them. Patience is at last rewarded, for, after due deliberation, one of their number thinks it time for breakfast. He drops from his perch, and then mounts steadily into the air; round and round he dreamily floats on his powerful pinions, the acme of grace and strength. Now we catch the gleam of his white head, the under wings and tail; then only a brown glow; all the while turning his head from side to side, until at last he spies his fishy victim in the watery depths. Closing his wings, the weighty bird drops from that great height, like a shot. He disappears, for a second or two, behind the reeds bordering the brook, then slowly mounts with a sizable, wriggling, writhing fish in his talons. Will he seek

his late perch, as a kingfisher would have done? No, how disappointing! He flies off to the distant side-hill, as if to eat in privacy, where prying eyes may not reach.

What will the others do? Slowly the second imitates the example of its mate, and flies away with its breakfast. But the third still sits in stately silence, so alluring that, with curiosity to see how near he will allow us to approach, we dip the oars and circle, with arduous care, around clump on clump of alders, until we have approached within fifty feet; but not a stroke nearer is endurable to even this equable bird, and he, too, drops from his perch, flies low above the meadow, and, mounting, follows, perhaps to share with the others, should a morsel yet be left.

That afternoon one of the ospreys returned, and again we had an exhibition of skilled fishing, bringing from those much-fished waters "finny prizes" of such dimensions as would be the envy of fishermen. The birds, the American Ospreys, or Fish Hawks (Pandion haliaetus carolinensis), appear in April and remain several days. Last year they arrived April 17 and remained until the twentieth. I once saw one of these birds, at another point of the lake, in August.

Dead specimens of wild things are valuable to us, but, better still, fill your heart with the inspiration and grandeur of these things, and the wonder of it all, by seeking them in nature's enchanting background.

WANTED: Part 2, Tuckerman's Synopsis of N. A. Lichens; Journal of Mycology, Vol. I, or Nos. 4, 5, 7, 8, 9, 10, and 11; Insect Life, Vol. II, No 2; Vol. VI, Nos. 1 and 2. T. J. FITZPATRICK, Box 1497, Iowa City, Iowa.

WANTED: Shrews, from any part of New Hampshire. Forward promptly, by express, at my expense. Don't send moles or mice. GEORGE E. BURNHAM,
Nature Study Press, Manchester, N.H.

Ferns and Fern Allies. VII.

BY FREDERICK W. BATCHELDER.

We have come at last to the parting of the ways; to that point in the evolution of ferns where a new path was struck out in the direction of specialization and of adaptation to modern conditions. We have seen that the ferns of the adder-tongue family (Ophioglossaceæ), formerly very abundant, have become so restricted in range and so reduced in numbers that we are obliged to hunt for them if we would find them. The royal fern family (Osmundaceæ), the connecting link between the ancient and modern forms, while conspicuous in our landscapes through the abundance and size of its plants, is poor in species, there being but ten known at present, only three of which are represented in our territory. In striking contrast with these two families stands that of the fern family proper (Polypodiaceæ), which comprises the great majority of ferns at the present day and supplies no small proportion of the covering of our earth. With regard to the relative abundance of the members of this family in the sum total of vegetation, I can do no better than to quote from Prof. Douglass H. Campbell, (Mosses and Ferns), as follows: "A somewhat prevalent idea that the ferns of today form merely an insignificant remnant of a former vegetation is hardly borne out by the facts in the case. Anyone who has seen the wonderful profusion of

FIG. 1.

ferns in a tropical forest and the enormous size to which many of them grow is very quickly disabused of any such a notion.'' Also in speaking of the abundance of these ferns even in temperate regions, he says, ''Occasionally a single species of fern, e. g. Pteris aquidina, (common brake) covers large tracts of ground almost to the exclusion of other vegetation.'' These last seven words, ''almost to the exclusion of other vegetation,'' are particularly significant as indicating the success which has attended specialization. Not only are these plants able to thrive passively in favorable conditions; they are able even to maintain a contest with plants of a higher organization and literally drive them from the field.

FIG. 2.

These facts, together with evidences gathered from the geological records, go to prove this great family, instead of being a ''left over'' type, is essentially a modern one. The ability to maintain 70 genera and 3000 species under modern conditions of life on our globe is of itself sufficient proof of enormous vitality and of wonderful adaptability. And to the observer who knows the ferns at all, a walk anywhere along country roads in summer will bring conviction of the truth of these statements. With the single exception of the osmundas, and possibly one grape-fern, all the ferns he sees are of this family and they are scattered broadcast, in field, meadow, glen, wood, swamp and bog, on cliff and in ravine, and at all elevations, from the sea to the mountains.

New England possesses a good representation of this family, having 13 genera and 40 species. The following are the names of the genera and the number of species in each: Onoclea, 2; Woodsia, 4; Dicksonia, 1; Cystopteris.

2 ; Dryopteris, 11 ; Phegopteris, 3 ; Woodwardia, 2 ; Camptosorus, 1 ; Asplenium, 9 ; Adriantum, 1 ; Pteris, 1 ; Pellæa, 2 ; Poiypodium, 1. The number for this locality, central southern New Hampshire, is, so far as at present known, 12 genera and 25 species. The missing genus is Pellæa, an inhabitant almost exclusively of limestone rocks and therefore scarcely to be expected here. On the other hand, several species not yet reported are to be looked for with confidence in our area. Of these more by and by.

The figures of Ophioglossum and Botrychium given in previous articles have shown how in the adder-tongue family, the plant throws up a single leaf which in fertile plants is divided into two portions, a sterile, leaf-like portion and a fertile, spike-like portion. In the familiar royal fern family, the leaves are numerous and large and the plants have quite the aspect of modern ferns. Certain leaves, or parts of leaves, are devoted to the fructification, the sporangia arising from divisions of the leaf which are destitute of chlorophyll. In the royal fern the upper part of the leaf, in Clayton's fern the middle part, and in the cinnamon fern the whole leaf, are thus utilized in the process of reproduction.

FIG. 3.

The fern family proper (Polypodiaceæ), while exceedingly various in the size of the plants and in the size, shape, cutting and texture of the leaf, without exception produces the fructification on the lower side or margin of the leaves or their segments, the sporangia being arranged in clusters or heaps (sori). The systematic arrangement of the genera depends largely upon the shape and arrangement of these sori. Other distinguishing characters are the presence or

absence of a special covering of the sori called the "indusium," and the different shapes assumed by that curious adjunct. The arrangement of the species is mostly dependent on characters more evident to the ordinary observer, such as the shape of the leaves, the disposition of the veins, and so on.

One of the first points which is likely to attract the attention of the amateur botanist is the unlikeness of the sterile and fertile leaves in some species. The ferns are in such cases said to be "dimorphous." The differences range in degree from slight to total, and would appear to be the result of the different proportions between the vegetative and reproductive energies in different genera or species. Where the reproductive energy is in excess the difference should be greater, and where the vegetative energy is in excess it should be less. If this is true, the greatest difference between the sterile and fertile leaves should be found in those members of the family which have been least differentiated from the primitive type. Specialization tends to promote the vegetative and reduce the reproductive energy. In the long run the principle holds that the lower a plant is in the evolutionary scale the greater, in proportion is its reproductive energy. A mushroom, the lowest of all familiar plants in organization, is practically all fructification. At the other extreme stand the seed-bearing plants, and in them the reproductive functions are entirely subordinated to those of vegetation.

In the fern family this principle undoubtedly prevails. While in our local species the illustrations of it are not numerous there appears to be an example in the very genus which heads the list and which, for sufficient reasons, is considered to have undergone the least specialization. This is the genus Onoclea, comprising only three known species, of which our area contains two species, the sensitive fern, (O. sensibilis), and the ostrich fern, (O. struthi-

opteris). In this genus the sterile and fertile leaves are totally different, the whole of the blade of the fertile leaf being absorbed in the fructification. It will not be many days now before the fern-lover may feast his eyes on the lively green of the sterile leaves which the sensitive fern sends up in every wet run and meadow-edge and swamp. These leaves are nearly as broad as long and are not quite pinnate, the divisions not extending to the mid-rib. (Fig. 1.) The fertile leaves of this season will not yet be found, but those of last season will be in evidence. They are in the shape of a stiff, dry, flattened spike and the narrow rows of now empty spore-cases look like dried-up berries as they still cling to the short branches. (Fig. 2.) Occasionally there may be found, early in the season, a curious intermediate form. A leaf which started out to grow into a fertile leaf had its development arrested mid way, and the result was that odd form of leaf which has gone by the absurd name of "variety obtusilobata." (Fig. 3.) Of course, it is only an accidental abnormal product, the result of arrested development.

The sensitive fern is very abundant in our area. The ostrich fern, more beautiful, perhaps, but no more interesting, is comparatively rare, being most frequently found in alluvial soil. About Manchester the extreme scarcity of this soil accounts for the absence, or at any rate scarcity, of this fern. Will any reader who discovers a station of this species kindly report it to NATURE STUDY? He shall have due credit therefor.

The Manchester Institute has secured the upright saw which was formerly used in the old saw mill on Black Brook. It was the gift of Mr. George A. Farmer and was the last "up-and-down" saw in use in Manchester. It is seven feet in length and is in good condition.

Woodpecker Architecture. II.

BY EDWARD J. BURNHAM.

If the sluggard may learn a lesson in industry from the ant, the student of nature who rejoices in well-directed expenditure of energy will find great pleasure in the contemplation of a woodpecker's nest. As suggested in a previous paper, the amount of labor involved is prodigious. The nest of the Hairy woodpecker is at the bottom of a vertical tunnel, nearly regular throughout its length, four inches in diameter, and varying from six to eight inches in depth. The cut (Fig. 1) gives an impression of irregularity, from the fact that the section of the tree was not divided equally, and our artist sketched the museum specimen as it appeared. The nest of the Downy woodpecker is somewhat smaller and less regular, but the bird is smaller, and is, perhaps, not quite so skilled a workman.

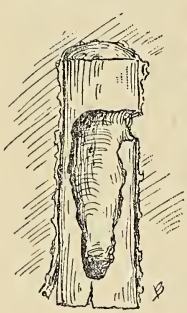

FIG. 1.

These nests are excavated in trees which are dead, or nearly so, but whose wood has not yet been much softened by decay. Just how the woodpecker manages to make the tunnel is a matter of conjecture. There are obvious difficulties in the way of satisfactory observation of a bird concealed in a limbless trunk at an elevation of twenty or thirty feet from the ground. It appears probable, however, that he clings to the side of the shaft, with his head downward, moving round as he pecks away—a conjecture that seems to be strengthened by the shape of the tunnel at its lower end, which is hollowed in the center, like the bottom of a cup. It is possible, of course, that this hollowing may be due to instinct, rather than to the method of excavation, since it is plainly an advantage that the eggs

should tend to roll together, and that the featherless young should be huddled in a bunch; and this cup-like form is common to the nests of most birds. The objection may be made, also, that woodpeckers do not usually run about upon trees head downward, as do the creepers; an objection which may perhaps be met by reference to the roughened or furrowed condition of the sides of the tunnel, possibly enabling the little workman to cling in an otherwise impracticable position. Unquestionably the safest course is to admit that we do not know where the woodpecker stands while excavating the vertical shaft, after he has progressed several inches below the entrance. So far as we have been able to ascertain, a thorough comparative study of a woodpecker's foot with reference to his capacity for vertical tunneling still remains to be made.

But while we do not know how the plan of the architect is brought to completion, we may easily become familiar with the finished work, for abandoned nests are to be found in any forest or patch of woodland that contains trees suited to the woodpecker's taste or capacity for drilling. The "hairy" is perhaps the most thorough workman of all the woodpecker tribe. His home is spacious and substantial, suggesting the idea that in its construction economy of labor was a secondary consideration. The entrance is circular, about two inches in diameter—more rather than less—and the tunnel goes straight down for six, seven, or even eight inches. The roof presents the appearance of a Roman arch, the wood having been cut away evenly from the entrance to the extreme opposite side. The "downy" is not quite so careful with the sides of his tunnel, which are somewhat irregular (Fig. 2), and in the shape of his roof he affects the Gothic style. He may pretend to his

FIG. 2.

chickadee friends, whom he sometimes shelters on cold winter nights, that the sharp, Gothic roof is due to his taste in architecture, but there is plainly a saving of labor as compared with the "hairy's" more thorough excavation.

When the tunnel is completed, the "hairy" and the "downy" alike cover the cup-shaped bottom with a bed of chips, preferably those of the bark, finely broken with their bills, and here, the house-building having ended, the home-making begins. The eggs change to hungry chicks, the chicks to full-grown birds, and when the woodpeckers have shifted their quarters, the nest remains, being occupied, in course of time, by bluebird or squirrel, and coming at last to be a veritable kitchen midden, replete with objects of interest to the investigator. But that, as Kipling would say, is another story.

Trapping Foxes.

The intelligence of foxes has been somewhat over-estimated. That he makes use of many tricks that are also practiced by other wild animals cannot be doubted; but his shrewdness and keenness of scent have been exaggerated in the many tales that have made Sir Reynard famous. So many have asserted that it is impossible to trap him without smoking the trap to remove the odor of human hands, that it may not be out of place to state that there lives in Manchester a gentleman who, in early life, was successful in trapping foxes without smoking his traps or doing anything to alter their odor.

Mr. Isaac Huse was born in Manchester when the present city was but a dream. Fond of out-of-door sports, he early acquired a liking for hunting, and the fox was his favorite game. In all ways has he secured the coveted pelt that would serve as a reminder and evidence of his

sport and skill, but perhaps his favorite way was trapping. This method is often slurred by so-called sportsmen, who extol the more brutal method of chasing by dogs and shooting. The fox is startled from his lair by the baying of hounds. He bounds away and leads his pursuers a long and stern chase, able to save himself from their teeth, only to be shot by a man concealed behind a tree, who waylays him as he passes. The trapper meets him on his own ground. He is not chased. He is in no hurry. He is hungry, and sees bits of meat scattered over a small space, smooth and attractive. Frequently it is too smooth, but in any event it is skill pitted against keeness of vision and animal mind.

The fall and winter were Mr. Huse's season of trapping. If the ground had not begun to freeze at night a small patch free from sods was chosen for a bed. This was raked or lightly spaded and smoothed; then a thin coating of the same kind of soil was sifted over to obliterate all marks of the hand of man. On this bed small peices of meat were carelessly scattered and then it was left without showing any marks of artificiality. It required experience to do this. Frequently several nights would elapse before a fox came. Sometimes several more would pass before he would dare to step upon so suspicious looking a place. Occasionally a skunk would find the bits of meat and devour them. This would be a help for his tracks would convince the fox of safety. When a fox, as indicated by his tracks, had eaten the bait for several nights in succession, a small excavation was made and in it the trap was set. Over the hinges of the jaws were placed longitudinally two flat strips of wood a little wider than the iron and long enough to escape being caught between the jaws as they closed. These were to prevent the sand from clogging the jaws as they closed. Earth was carefully built in between the jaws and the trencher so that when the final covering was made

there would be no earth under the latter. The last process was to slowly sift earth over the trap and the entire bed, obliterating all traces of the trapper. Bait was scattered over the bed as before and after the first experience that one must have in everything rarely did Mr. Huse fail, sooner or later, to outwit his wily game.

Once when the trap was placed near the center of a bed the fox that frequented the locality came every night, took all the bait and stepped everywhere except where the trap was. One day the trap was taken up and placed near the edge of the bed. The next morning the fox was there.

In the winter the bed was made of chaff or dry horse manure. Then the seive and snow scooped up some distance away would make the bed and the neccessary tracks look old enough to escape suspicion.

The New Star. Nova Persei.

BY GEORGE I. HOPKINS.

Since the preparation of the last number a most interesting astronomical event has been chronicled. On February 21 Dr. Anderson of Edinburgh, Scotland, an amateur astronomer, dlscovered a new star, of about the tenth magnitude, in the constellation Perseus. It rapidly increased in brightness until a maximum was reached on the morning of the 24th, three days later. It was then brighter than a star of the first magnitude, consequently rivaling all in its neighborhood. Since then it has gradually but steadily declined in brightness, until at the present writing it does not exceed the fifth or sixth magnitude, being just visible to the unaided eye.

If the reader has not yet been able to locate it, and it should still remain visible, the following directions will enable him to do so. The constellation Perseus is now in

the northwest, at an altitude of about forty or fortyfive degrees at about eight o'clock. Alpha Persei, Algol and Epsilon Persei form a very conspicuous triangle, Alpha and Algol being about ten degrees apart and Epsilon about ten or twelve degrees above them. The new star, called Nova Persei, is almost in the exact center of this triangle and is of a reddish tint. Perhaps it can be more easily located by drawing a line from Alpha Persei to the Pleiades, which are at this time exactly in the west and at about the same altitude. Nova is the first star in that line, starting from Alpha, and is about five degrees from the latter.

This is not the only instance of the sudden "blazing up," as it were, of a new star, as there have been recorded something like fifteen or sixteen in all. It should be said in passing, however, that, although these stars are called Novæ, the Latin for new, astronomers do not regard them as new, but merely as members of the class called variables, with a long period. The last one before this, visible to the naked eye, was in December, 1891, and was in the constellation Auriga. Singularly enough, this same Dr. Anderson also discovered this one independently in the following February. Nova Aurigæ, at its brightest, was between the fifth and sixth magnitudes, or just about like Nova Persei at the present time. In 1895 the former had diminished to between the tenth and eleventh magnitudes, where it has since steadily remained as a nebulous star.

The most famous of these so-called new stars was the one observed and chronicled by the astronomer Tycho Brahe, in 1572, in the constellation Cassiopeia. This was said to be the equal of the planet Venus when at her greatest brilliancy, and remained visible about sixteen months, gradually diminishing in brightness. The most prominent one in recent times was one that appeared in May, 1866, in the constellation Corona Borealis, and was discovered by five observers independently. It is of special interest as having

been the first of the Novæ to be examined with the spectroscope, which showed the same bright lines of hydrogen that are so conspicuous in the solar prominences. "Hence it is not unlikely," says Professor Newcomb, "that the blazing forth of this star arose from an action similar to that which produces the solar flames, only on an immensely larger scale. * * * Is there any possibility that our sun may be subject to such outbursts of heat and light as those we have described in the cases of apparently new and temporary stars? We may almost say that the continued existence of the human race is involved in this question; for if the heat of the sun should, even for a few days only, be increased a hundred-fold, the higher orders of animal and vegetable life would be destroyed. We can only reply to it that the general analogies of nature lead us to believe that we need not feel any apprehension of such a catastrophe. Not the slightest certain variation of the solar heat has been detected since the invention of the thermometer, and the general constancy of the light emitted by ninety-nine stars out of every hundred may inspire us with entire confidence that no sudden and destructive variation need be feared in the case of our sun."

Other Novæ were discovered in 1876 and 1885, the latter appearing in the great nebula of Andromeda, very near the nucleus. It began to diminish in brightness very soon, and in a few months had disappeared from view. Nova Aurigæ, mentioned before, remained visible to the unaided eye only about three months. Its examination with the spectroscope revealed an interesting condition. In its spectrum bright lines were numerous, those of hydrogen, helium and calcium being especially prominent. A curious and unique thing was also observed, viz.: each of these bright lines was accompanied by a dark line toward the violet end of the spectrum. The explanation of this is that there are two bodies concerned, one of them, the one

showing the bright lines, receding from us, and the other, showing the corresponding dark lines, approaching us. The spectrum of Nova Persei reveals a similar condition of things. Several theories have been advanced to explain this singular phenomenon, but the one now generally accepted was advanced by Seliger, soon after the appearance of Nova Aurigæ. This theory is, briefly, as follows, and is based upon the now unquestioned existence of *dark stars*. A dark star and a nebula, moving in opposite directions, encounter each other with a relative velocity estimated at from 500 to 700 miles per second. The friction thus caused would develop a tremendous amount of heat energy, sufficient to render the surface of the dark star incandescent, and in all probability sufficient to vaporize a portion of it. The nebulous mass would also be heated by the impact and likewise glow. According to the Scientific American, "there are strong reasons for suspecting that the recent outburst in Perseus represents an occurrence of this sort, and that the star and nebula will disappear from view after a few weeks or months."

Photography has recently played a very important part in the study of the stars, as the camera will often detect a star that eludes the eye, even with the best modern instruments. In fact, two Novæ were discovered by the photographic plate, one in 1893 and another in 1895, at the Harvard College station in South America. When these were examined with the spectroscope, they showed the same bright and dark lines as those above mentioned. This leads Professor Young to remark: "It now seems rather probable that 'new stars' are not really extremely rare, and it is clear that there are important physical resemblances between them."

When the news of the discovery of Nova Persei was received at the Harvard observatory, an examination of the photographs of that region of sky for a month previous

was at once made. Curiously enough, the new star appeared on the plates for February 2, 6, 8, 18 and 19; so the Harvard camera was after all the real discoverer.

Binny's Instinct.

LEAVES FROM THE NOTE-BOOK OF A NATURALIST.

It has been asserted, and in some degree proved, that the song of birds depends on that which they first hear; but their nest-making appears to be the result of innate instinct. Binny must have been captured too young to have seen any of the building operations of his parents or their co-mates, but his instinct impelled him to go to work under the most unfavorable circumstances; and he busied himself as earnestly in constructing a dam, in a room up three pair of stairs in London, as if he had been laying his foundation in a stream or lake in Upper Canada.

Bread, and bread and milk and sugar, formed the principal part of Binny's food; but he was very fond of succulent fruits and roots. Tender twigs, especially of the willow, were greatly to his taste, and he would handle them very adroitly, drawing them through his fore-paws, which he closed upon them much as a basket-maker would do when trying a twig, though less perfectly of course.

An animal so sociable in his habits ought to be affectionate; and very affectionate the beaver is said to be. Drage mentions two young ones, which were taken alive and brought to a neighboring factory in Hudson's Bay, where they throve very fast until one of them was killed accidentally. The survivor instantly felt the loss, began to moan, and abstained from food till it died. Mr. Bullock mentioned to the narrator a similar instance which fell under his notice in North America. A male and female were kept together in a room, where they lived happily till the male was deprived of his partner by death. For a day or two he appeared to be hardly aware of his loss, and brought food and laid it before her; at last, finding that she did not stir, he covered her body with twigs and leaves, and was in a pining state when Mr. Bullock lost sight of him.

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How to Find the Constellations. X.

BY GEORGE I. HOPKINS.

Since the moon reaches the full phase on the third of this month it will probably seriously interfere with the star gazing. It is a good exercise at such a time for the observer to see if he can locate accurately the constellations already named when only a few stars are visible for guidance. He will probably notice that Orion is in the west, nearly, if not quite, at the horizon, while the brilliant star Sirius keeps up an almost incessant twinkling low down in the southwest.

Leo will be noticed considerably past the meridian, and the Twins almost exactly in the west, half way between horizon and zenith. In the east the yellow star Arcturus is seen at an altitude of about forty degrees, and it is barely possible that one may be able to recognise Corona Borealis just below it. Turning now to the northern sky the Great Dipper is seen nearly in the zenith, and the Little Bear about the same altitude as Polaris toward the north-

east. If Nova Persei be now visible it will be seen quite near the horizon, together with Algol and Alpha Persei, and the Hyades also farther to the west, all of them near to setting. Over in the northeast almost exactly, Vega may be seen just rising, while Cassiopeia and Cepheus have reached their lowest culmination, one on each side of the meridian, thus fixing the limit of the region of stars that never set to the Manchester observer.

While surveying this portion of the heavens the observer may, if he can crane his neck sufficiently, see a small group of third and fourth magnitude stars between Leo and Ursa Major. This is the constellation Ursa Minor. Although so few are now visible yet it contains fifty-three stars, only one of which is of the third magnitude and five of the fourth. This is comparatively a modern constellation, having been formed by Hevelius out of the surplus stars between Leo and Ursa Major ungrouped by the ancients.

Directly east of the Dipper and Leo Minor can be seen, perhaps half way between the Dipper and Arcturus, a star of the third magnitude. This is Cor Caroli or Charles' Heart, so named by Sir Charles Scarborough in memory of King Charles the First. It is the most prominent star in the constellation Canes Venatici, the grayhounds, or hunting dogs. This also is a modern constellation, having been made by Hevelius out of the ungrouped stars between Bootes on the east, and Ursa Major on the west. These hounds are represented on the pictorial star maps in pusuit of the Great Bear which Bootes, the mighty hunter, is following around the pole, while he holds in his hand the leash by which they are fastened together. Their names are Asterion and Chara.

South of Canes Venatici and on a line drawn from Regulus to Arcturus and about two-thirds the way may be seen a beautiful cluster of small stars between the fourth and fifth magnitudes, their confused lustre somewhat resembl-

ing the Milky Way. This is the constellation Coma Berenicis or Berenice's Hair. Although the stars which compose it are all so small as to be rarely distinguished in the abundant light of the full moon, yet it is not easy to mistake it for any other group in the same region of the sky.

Berenice was of royal descent and a lady of great beauty, who married Ptolomy Soter, one of the kings of Egypt, whom she loved with much tenderness. When he was going on a dangerous expedition against the Assyrians, she vowed to dedicate her hair to the goddess of beauty if he returned in safety. Some time after the victorious return of her husband, the locks which, agreeably to her vow, she had deposited in the temple of Venus, disappered. The king expressed great regret at the loss of what he so much prized; whereupon Conon, his astronomer, publicly reported that Jupiter had taken away the queen's locks from the temple and placed them among the stars.

> "There Berenice's locks first rose so bright,
> The heavens bespangling with dishevelled light."

Conon, being sent for by the king, pointed out the constellation, saying: "There behold the locks of the queen." These being among the ungrouped stars until that time, and not known as a constellation, the king was satisfied with the declaration of the astronomer, and the queen became reconciled to the partiality of the gods.

Directly below Leo is a region of small stars below the fourth magnitude, comprising a space about fifteen degrees square, the celestial equator cutting it exactly in halves. This is the constellation Sextant, and contains in all forty-one stars. It is so called because of its supposed resemblance to the nautical instrument of that name.

True Story of Peggotty Zamelodia Ludoviciana

BY MARY HAZEN ARNOLD.

I wish you could all know our Peggy. You'd be sure to love her; she is such a compound of mischief, affection and intelligence.

Shut your eyes and see if you can guess what Peggy is. A little gray kitten? No. A pony? Oh! no! A white rabbit, perhaps? Wrong again! She is a dark brown and buff bird—two inches shorter than a robin—with wings lined with yellow. She is not a beauty, but knows a great deal and is very loving.

Her real name is Peggy, but we call her Peggotty Zamelodia Ludoviciana for short. Her present home is in a cage in a sunny window of our dining room. She has been with us for four months, and we have spent many pleasant hours together and have become good friends. She rides about the house on my shoulder, or head, and follows me from one room to another, and when I sit down will perch on my arm, or close by, or fly into my lap. She sometimes tries to help me sew, seizing the needle with her bill as I take a stitch, and unless I rescue it quickly, flies off with it to the top of a door, or she will balance herself on my embroidery hoop and try to bite off my thread.

Do you remember when you were out at grandpa's house last summer, and went through those beautiful woods after blackberries, you came upon a rippling, dashing brook; which ran over the stones and peb bles and finally came out into the green meadow and meandered into the Connecticut river? If you had followed this brook to its source—about two miles from grandpa's house—you would have found a clear spring bubbling from beneath a huge granite rock, with green mosses and ferns about it, and the sunlight glinting down through the leaves of chestnuts, oaks and maples, with here and there a tall, dark pine. You

would doubtless have noticed, in the top of the tallest pine, the bulky nest of the identical black crow which made such havoc in the cornfield last summer. But if you had looked among the branches of the oak which stands just below the spring, you might have seen the cradle which was the first home of our Peggotty. It does not look one bit like the nest you would suppose such a beauty as Mr. Grosbeak would build for his babies—simply twigs, so lightly thrown together that you could almost see the spotted blue eggs from beneath.

One morning last summer, in early June, I came upon Mr. and Mrs. Grosbeak preparing for housekeeping. He was a handsome fellow—pure white beneath, with a bright rose-red breastplate tapering to a point. He wore a black velvet cap and a black velvet coat with snow-white feather trimmings. He was quite a contrast to his mate, in her sparrowy browns. Soon after, the cradle of brown sticks held four blue eggs, carefully sheltered by the warm, soft feathers of the mother's breast. The father bird, too, took his turn in sitting on the eggs, and in course of time there were four baby birds, with gaping mouths always ready for breakfast, dinner and supper, which the old birds were kept busy supplying.

But, alas! One day a sad thing happened. Mr. Grosbeak was shot by a thoughtless hunter. Then Mrs. Grosbeak had to work very hard to find food for her little ones. One day she flew off for food and never returned. I never knew what became of her. A short time after, one of the babies fell from the nest and was killed; a second died from hunger, and the other two were carried home by Cousin Harry and cared for. When he returned to school in September, Peggy came into our possession, and her brother found a happy home with a friend near by.

Peggy has a soft, sweet little song, and, when all is quiet, will sometimes sing for an hour at a time. She seems

to enjoy music, and will sit with feathers fluffed down over her feet, her head on one side, listening, and will often join in the singing, stopping as soon as the singers stop, and joining again with them.

Her cage is usually left open in the morning for several hours, and she goes in and out at will. There is a dish of ferns on the table, which she admires very much, but, like your baby sister, she thinks everything is good to eat, so, unless the ferns are removed before the cage door is opened, they have their heads nipped off in a very short time. She likes to be around when apples are pared, and cracks the seeds with her strong bill, and eats them greedily, but is particularly fond of peanuts. When we are at dinner, she will scold and beg till her door is opened, when she at once flies to my shoulder, and expects to have a taste of everything upon my plate, and thinks it is a little better if she can take it from my lips.

But, as this is a *true* story (as I write, Miss Peggotty sits on my shoulder, and gives an occasional bite—a love bite—to my ear or cheek), I must admit that this pet of ours is sometimes naughty. She does not *always* mind, and is often saucy and mischievous. When a dear white-haired lady was visiting us, this saucy bird would light on her head and try to pull out the silver threads; then she would nibble her glasses, aad turn her head from side to side, and look at grandma in a very impudent manner. When the spectacles were left on the table, Peggotty would seize them, and once carried them a short distance and dropped them upon the floor, then flew off with a sharp "peepk! there!"

Matches and toothpicks are scattered all over the floor, if she has a chance to get at them; the needles and pins on the cushion are pulled out daily. I have seen her pull pins out and put them back in the cushion, but she usually leaves them where they chance to fall.

I have time to tell you of but one more of Peggy's pranks.

Listen, and you shall hear how she ran away from home one raw January day. She slipped through the back door, when it was opened for an instant, and, as quick as a flash, was out of sight around the *north* side of the house. I hurried after her, but not a glimpse of her could be had: I went all around the house, calling her, and into the woods above in search of her, but no Peggotty was to be found, and I feared the poor bird would soon perish with cold. But two and a half hours later, as I sat by a *south* window, I heard a sharp "Peepk, *peepk*, PEEPK! Please let me in!" And there sat the runaway on the window sill, asking as plainly as a bird could ask, to be let in.

I assure you I was not long in opening the window. The noise startled her, and she flew up to the top of the blind, but at my call she came down upon the top of my head, and I lost no time in welcoming her back to warmth and safety. She seemed very glad to see me—I was to see her. I gave her a red-pepper pill, and she at once went to eating seeds, took a little rest, and in a half hour's time was hopping from perch to perch, and playing with a spool, as unconcernedly as if a trip out into the wide, wide world was an everyday occurrence, and at no time since has she seemed the worse for her adventure.

Won't it be delightful when all the birds of the woods and fields are as tame and friendly as Peggotty Zamelodia Ludoviciana? When they will come to greet the boys and girls out for a stroll; when cats will cease catching and eating birds; when small boys will make bonfires of their air rifles; when we shall love our neighbor as ourself. When that time comes, we shall not fear to throw doors and windows open wide, and let Peggy go in and out at her own sweet will.

I must confess that the account of the first home of this rose-breasted grosbeak is partly imaginary. Otherwise, my tale is strictly true.

Waterbury, Conn.

Ferns and Fern Allies. VIII.

BY FREDERICK W. BATCHELDER.

As noted in the last article, the genus Onoclea, represented in our area by the sensitive and ostrich ferns, presents the phenomenon of dimorphism in its most striking form. The fertile leaves are totally unlike the sterile leaves in appearance. They are bipinnate, but the divisions of the pinnæ (the pinnules) are short and small, and each one becomes rolled up into a berry-like body which forms a sort of involucre to the sporangia borne on its inferior surface. At maturity the pinnules unroll and the spores are thus allowed to escape.

But it is not the extreme dimorphism alone which indicates that the genus is of more ancient origin than the rest of our ferns. The geological record furnishes a very remarkable corroboration of the inferences drawn from the present character of the plants themselves. There are fossil remains of the sensitive fern in very perfect condition, and these show that this species has undergone very little change since the carboniferous era. In fact, this is the only fern which has yet been found in the fossil state in almost exactly the same form as that in which it is growing today. The only difference discernible between the present and the fossil forms is that in the latter the texture of the leaves is more leathery (coriaceous).

To undertake a systematic description of all the ferns of the great family Polypodiaceæ would transcend the limits of NATURE STUDY. Moreover, it would be unnecessary, the various text books supplying all need in that department of study. While the arrangement of orders and genera in Gray's Manual has been superseded by the more recent one inaugurated by Engler and Prantl, the descriptions of orders, genera and species are in the main to be depended on. The student will do better, however, to be-

come familiar with the newer system at once, as more in accordance with recent discoveries concerning the interrelations of the pteridophytes. This system has been adopted by Professor L. M. Underwood, in his contribution to Britton and Brown's Illustrated Flora, Vol. I. (Subkingdom Pteridophyta, Ferns and Fern Allies). The *Fern Bulletin* publishes interesting and valuable papers. There are also miscellaneous articles on ferns in the various botanical publications.

Among the characters on which the systematic arrangement of the genera and species in this family is founded, one of the most prominent and decisive is that of the temporary covering of the sori, called the "indusium." In the great majority of the members of this family this indusium is present. In only two of our genera is it absent. When it is present, it may be a true or a false indusium. So it results that in relation to the indusium the family is divided into three sections; 1st, those genera which have a special indusium; 2d, those which have a so-called false indusium; 3d, those which have none. Two of our genera have no indusium, Phegopteris (Beech Fern) and Polypodium, the latter being the type of the family. It is to be regretted that there is no good English name for Polypodium. "Polypody" is, like most literal translations of Latin names, meaningless, and "polypode," which I notice is used by Bailey in his new "School Botany," is no better. May I venture to suggest the name "Many-footed Fern?" This would be a good translation of the scientific name, it would express a character of the plant itself, and it would be understood by persons who are not familiar with Latin.

Three of our genera have a false or makeshift indusium. They are Adiantum (maiden-hair), Pteris (common brake) and Pellæa (cliff brake). In them there is no special covering evolved for the protection of the young sori, but the

edge of the leaf is deftly turned over them, like a hem. In Pteris this hem is continuous, in Adiantum it is in sections, in Pellæa it is continuous, in all it is more or less modified and membranous. It will be interesting for the student to watch, from week to week, the growth of fruitful plants of the common brake. It may surprise him at first to note how small a proportion of the plants bear fruit. He may turn over hundreds of leaves where the plants are growing in shade, and find them all sterile. In sunny spots he is more likely to find the object of his search. Then, as the season progresses, he can watch the gradual swelling of the sporangia under the long, narrow indusium, until at length the pressure from within ruptures it along the inner edge and the fruit is exposed.

There remain eight genera in which there is a true indusium. In them it consists of a scale-like outgrowth from the lower side of the leaf. Various forms are assumed by this special adjunct, according to the arrangement of the sori. The method of attachment, the texture, the condition of the surface and the evanescence or persistence of the indusia constitute systematic characters of great value in the identification of genera and species.

In Onoclea the indusium is membranous and hood-shaped and is attached underneath the sorus. In Woodsia it is also attached underneath, like the cloth covering of a button. In most of the species it subtends rather than covers the sorus and is early reduced to a few thread-like segments. In Woodsia obtusa, however, it at first encloses the sporangia and at length splits into a few rather wide, jagged lobes. In Dicksonia it is in the shape of a cup, open at the top and attached on the outer side to a toothlet of the leaf. For the indusia of Cystopteris search must be made early in the season, for the double reason that the plants fruit early and that the indusia very soon wither, leaving the sporangia naked. In the genus Dryopteris (Aspidium)

the indusia are orbicular and flat or flattish. The species are divided into two groups, according to the mode of attachment of the indusium. In one group this is attached by the center, in the other by a notch or sinus in the side. The two methods are well illustrated in the familiar Christmas fern (D. acrostichoides) and the equally common marginal fern (D. marginalis). It is not unlikely that the genus may eventually be divided and a new genus made of those which, like the Christmas fern, have the indusium attached by the center.

In the three remaining genera the sori are arranged longitudinally in linear or oblong rows and the attachment of the indusium is correspondingly different. In Woodwardia, where the sori are sunken in the leaf in interrupted rows which resemble chain stitching, the indusium is fixed by the outer margin and covers the cavity like a lid. In the rare Camptosorus the sori are scattered very irregularly and the indusium is membranous. Lastly, in the genus Asplenium the indusium is attached to the outer side of the sorus and opens on the inner side towards the midrib. The common lady-fern (A. filix-fœmina) differs from the other species in that the sori are curved so as sometimes to cross the fertile veinlet, and in consequence the indusium sometimes appears to open outward rather than inward. It sometimes happens, notably in A. acrostichoides (thelypteroides), that some of the sori and indusia are double. In that case one half necessarily opens outward.

It is an interesting question whether the presence or absence of the indusium denotes the greater degree of specialization. The fact that some of the highest genera are able to get along without it would seem to indicate that it is of early origin and is now in process of elimination. Possibly the genera with false indusia mark the half-way stage of fern economy so far as concerns the protection of the young sporangia.

One Morning in Florida.

BY A PINFEATHER ORNITHOLOGIST.

On the 28th of February we astonished the driver of our thin, hired horses by telling him that we did not care to be driven by the oldest house in America, nor yet to Fort Marion and the Slave Market, but that we wanted to go to a place where we could see birds. St. Augustine offers so much of historic interest to the tourist that Joe needed a good deal of talking to before he said he "reckoned Kerr's Island 'ud be the place." So to Kerr's Island we went by way of a live oak wood hung with Spanish moss.

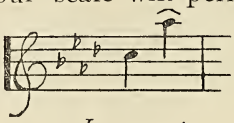
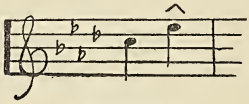
Black and turkey vultures were dreamily circling in the brilliant blue sky, blue as Italy's it seemed to me. The cardinals, male and female, were whistling "whit *ts* er" repeatedly from bush to bush and kindly allowing us to approach within satisfying distance. A white throated sparrow, some song sparrows, silent but fairly tame, and a phœbe, called "bee biddy" by Joe, and a red winged black bird greeted our sight as we emerged from the wood out on to the marshes. Those marshes! Acres and acres of them stretched away on every hand, and through them wound narrow, tortuous arms from the bay, which at low tide left mud flats exposed, dear to the stomachs of many waders.

A marsh hawk was flying over the sedges in low, wide circles, great blue herons stood patiently fishing in midstream, and far to the left, looking like a white post in the reeds, was the American Egret, a bird some forty odd inches long and who seemed to stand three feet and a half high, a beautiful, snowy creature all too rare in Florida now, thanks to the man with the gun. We saw three of these birds there that morning, and none anywhere else in Florida, though we walked far and wide in hope of finding them again. Kerr's Island being private grounds where no shooting had been allowed for a period of years, the egret was

there sure of a safe abode. Little blue herons, both mature and immature, we saw in numbers in and around the ponds in the marshes. The young bird is almost pure white, and his shining plumage seemed entirely out of place in so black and muddy a hole as he chose for a dining room that day. On a stake sat our first boat-tailed grackle, large, black and uninteresting it seemed to us who were reveling in a first sight of white egrets, sky blue herons, cardinals, and mocking birds. Not that the little blue heron is really a sky blue; he is a much deeper shade than that as he stands before you, but let him fly, and let the sunlight strike him properly and there he is the sky blue color every woman loves. Dangling his yellow legs for a bit, then straightening them out stiffly behind him, now tucking in his long neck till his head seems to come out directly from between the wings, off he goes, to alight in the next muddy pool. Now our eye is taken with the fish hawk, a really beautiful bird, whose huge wing spread, graceful sailing and loud call make him conspicuous all along the Florida coast. It is an inspiring sight to watch him fly over the water, his keen eye looking for fish, to see him rapidly descend and when near the water let down those strong, grasping talons of his and set them tense and firm ready for his plunge. Now he emerges from the water, shakes himself a bit to let fly the few drops with which his splash baptized him and off he flies to the nearest safest tree top, and eats his fish, and here we leave him for the inspiration and excitement of the catch have degenerated into the repulsiveness of a gorge, and we feel sorry for the fish.

We saw our first bald eagle flying over these marshes, and hoped to see him try to get the osprey's fish away from him, but we had to be satisfied with Joe's description of how he did it. Nor did we ever see this interesting sight while in Florida.

Our drive was taking us all this while over a causeway, paved with broken bricks, to the island. Here we

were greeted by the American pipit, a new bird to us, and the white-eyed chewink, who, contrary to the books, was very tame. He allowed us to come near to him, uttering all the time his "joree" call, which is literally "jor-*ee*," and not "che-wink," as is that of his northern cousin. The last syllable is sung a third higher than ours. As nearly as the intervals of our scale will permit me to write it, it is like this:  while the red-eyed sings:  Kingfishers, loggerhead shrikes, two brown pelicans, seen from the sea side of the island, numerous Bonaparte's gulls, twelve gannets fishing very far out at sea and visible only with the powerful Zeiss glass we carried, myrtle warblers, without the yellow on the head, and some killdeer completed that day's list of birds.

Jo - ree!

Che-wink!

On the return trip we watched the black vultures walk around a refuse barrel—and laughed heartily over the performance—now with the neck stretched out, now with it drawn in; now, fancying he could do it with a heron's grace, he slowly lifts his ugly feet and waddles ludicrously; now he accelerates things by half lifting his untidy wings, and then he buries his repulsive head in matter unthinkable. and, after gorging himself, flies off, in this instance, to a fence post, and, hunching himself together, sits long in the sun, occasionally half-spreading his wings, or clumsily turning himself to face a shifting wind. It is only when on the wing, soaring and sailing in the sweet blue of a southern sky, that this bird appeals to one. At other times one recognizes him as a necessary scavenger, but heartily wishes this degrading office had been given any other animal than a bird.

Two Hunters.

BY WALTER S. ABBOTT.

In the genus Calosoma are found two species that would attract the attention of the most casual observer by their size, beauty and ferocity; namely, Calosoma scrutator and Calosoma calidum. Calosoma, which is (according to the classification of Leconte and Horn) the second genus of the tribe Caribini, is noted throughout the world for the size and beauty of some of its members, Calosoma sycophanta being considered the most beautiful beetle in Europe, and although our species will not equal his beauty, still they are worthy followers.

Calosoma scrutator, in particular, is a very pretty beetle. having wing covers of a beautiful iridescent green, bordered with a band of ruby, and a head and thorax of a deep violet purple. It is one of our largest coleoptera, measuring in some cases almost an inch and a half in length, and when alive its long legs and antennæ make it seem even larger. However, his heart is as black as his form is beautiful, for a more savage and rapacious insect is rarely to be found. He well deserves the name of Hunter, won by him in many a fierce and sudden attack, and woe to the unfortunate insect that he spies when on a hunt, for there is no escape from those strong mandibles, and flight is of no avail, for the Hunter is fleet of foot and can run down the fastest Carib.

Duncan states that these beetles often ascend trees in the search of caterpillars, which are its favorite food, and that the adult and the larva may frequently be seen feeding together. The appetite of this beetle is really something astonishing, one that was kept by the writer last summer actually devouring, in one night, two specimens of the common dor-bug (Lachnosterna fusca) and one Polyphilla,

and in the morning appeared, like Oliver Twist, to be asking for more.

Calosoma calidum is neither as large nor as beautiful as its cousin, the scrutator, but it is more abundant, and will often be seen during the warm evenings of June, scurrying away from his feast under the electric lights when disturbed by the passer-by. He is a somewhat striking beetle, being quick and graceful in his movements and having rather pretty markings, his elytra being a deep brownish-black, with six longitudinal rows of punctures—in some specimens of a reddish golden tint, and in others with more of a silver tinge. The thorax is broad and the head large, with strong, sharp mandibles and prominent palpi, the whole insect measuring from six-eighths of an inch up to an inch.

Both of these beetles are found here in Manchester, Calosoma calidum being rather common in certain sections of the city, while the scrutator is more rare, the writer having seen but one during the past two years, that being brought him by a person whom he, half in jest, had instructed to look for this very insect, and who recognized it from the description given and secured the prize.

During the day the Hunters generally remain in hiding under some friendly stone or clod of earth, and are seldom seen until night, when they sally forth in search of their prey, and they can often be found under the electric light, where they find food in plenty waiting to be eaten. The only protection they have, in addition to their speed, is a very evil smelling liquid that they are able to eject when frightened or hurt. In the case of the scrutator this liquid has something the odor of carrion, and in the calidum it is something like very strong turpentine and produces a brown stain on the skin that is very difficult to remove.

The larva of Calosoma is similar to the larva of the rest of the Carabidæ, only being a little larger. It is active,

elongated and flattened, with a large head, well developed mouth parts and three pairs of thoracic feet, with a single pro-leg on the terminal segment of the body. When the larva is full grown it descends into the earth and changes into a nymph, and then reappears a fully developed hunter and starts forth to kill, or to be captured by some enthusiastic entomologist and his hunting stopped forever.

A Nature Study Lesson.

BY EDWARD J. BURNHAM.

The children are hungry—have always been hungry—for knowledge of the world about them. This world is, for them at least, fresh and new and full of wonder. They want to know about it; they ask many questions. We are beginning to perceive, many of us, parents, teachers, uncles, aunts, friends, that we must take an interest in what they are interested in, or lose much of the better part of our influence over them. We are also slowly coming to see, too, that there is mental discipline in nature study; that there is practical value in habits of keen observation, of development of the reasoning faculty.

FIG. 1.

Let us begin then, and with the simplest objects. Of course we know there is no simple object in nature; everything is so related to other objects, uses, general plan; but let us cull an object—pull out a feather, or pick one up. A pigeon's, or a hen's feather, is best, but any feather will do. Show the expanded part, the vane (Fig. 1, a), the quill (b), the central axis, the shaft (c). Pull off a side branch of

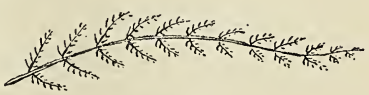


FIG. 2.

the shaft, a barb, and see how the barbs, too, have branches, the barbules. Figure 2 shows a barb, magnified, with the barbules represented as farther apart than in nature. Cut a vane and shaft across and show, as in Figure 3 (a, shaft; b, barb) how the barbs are attached to the shaft, like the wings of a bird; then cut a barb and show how the barbules are arranged in the same way—birds, vane, barbs, all having a similar form. Figure 4 shows this appearance of birds in flight at a distance. Then show how feathers lap over feathers, barbs over barbs, barbules over barbules, all closing tightly with the down stroke of the wing, all falling loose and open on the upward stroke. On the downward stroke the texture of a wing is as that of the finest silk fabric; on the upward stroke it is as open as the slats of a window shutter. Show how hollow the quill is, how the "shell" of the shaft is folded to form a tube. Compare this with bicycle tubing, so light, so strong. Show how the shaft of a feather was, perhaps, the first and finest tube construction in the world.

FIG. 3.

Note the curve of the shaft in the wing and tail feathers. Find that in many birds the middle tail feather has the barbs of equal length; that all body feathers are symmetrical. These few simple facts, once well understood—and they can be grasped by the average child in ten minutes—will remove all wonder how one can tell, upon picking up a feather, whether it came from body, wing, or tail, and whether from the right or left wing; from right side or left side of tail. This bit of knowledge will quicken a child's observation, and will add to the pleasure of every walk afield throughout one's lifetime. It is worth while.

FIG. 4.

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